AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 23

NEW YORK, JUNE 6, 1918

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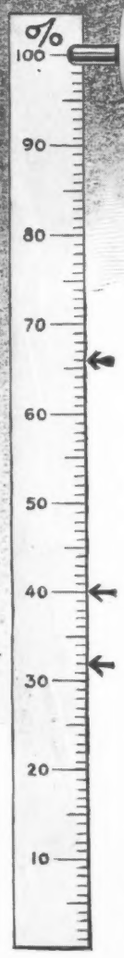

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Thousands of different combinations and mixtures of materials gathered from all over the world!

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Steady improvement in spark plug porcelains all this time—but no great gain upon the increasingly severe requirements of new developments in gasoline motors!

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So Champion Dependability takes on new meaning—for no spark plug can be more dependable than its insulator.

The Champion Spark Plug Company, Toledo, Ohio

CHAMPION TRADE MARK

Champion

Dependable Spark Plugs

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Advertisers' Index—Next to last page

Movie of Man Patching Tube in 3 Minutes

Sand paper around hole and clean with gasoline—2:00 o'clock

Apply Self-Vulcanizing Liquid and let dry—2:01 o'clock

Cut patch ½ in. larger than you need to cover hole—round the corners—2:02 o'clock

Lay over hole and press on firmly—2:03 o'clock

THIS method of patching tubes and casings is the easiest on record—it's so simple that a child can use it.

Johnson's Hastee Patch is not a make-shift—with it you can permanently mend a tube or casing. It is much more satisfactory than vulcanizing because there is no danger of burning and spoiling the tube. It takes but two or three minutes to perform the entire operation and the tube can be pumped up immediately and is ready for instant use at any speed.

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

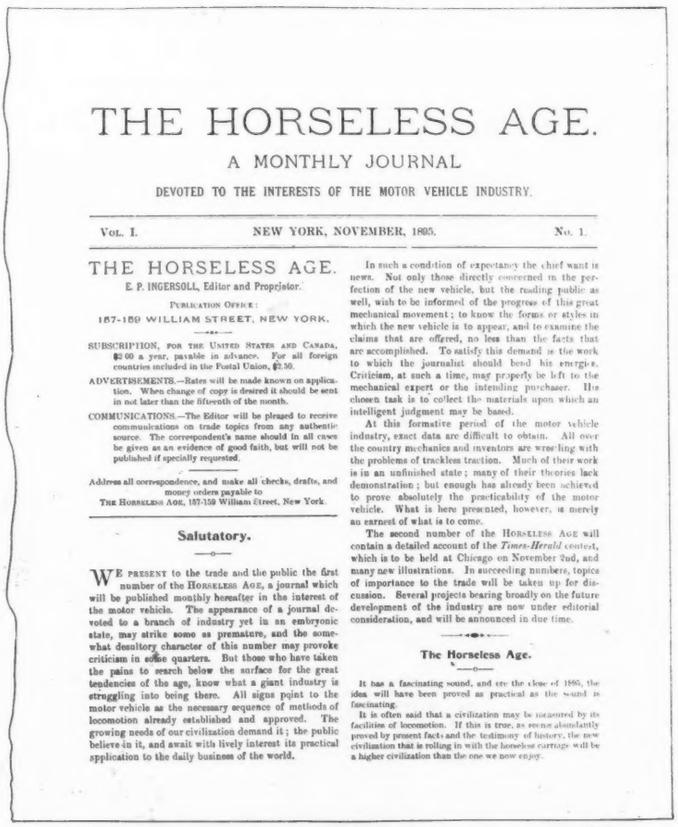
VOL. XXXVIII NEW YORK—THURSDAY, JUNE 6, 1918—CHICAGO NO. 23

Horseless Age Merged With the Class Journal Publications

Oldest Automobile Publication in English Language Becomes Part of Automotive Industries, Motor Age and Motor World—Automobile Landmarks of 1895

AS was announced a short time ago on the news pages of AUTOMOTIVE INDUSTRIES, the Class Journal Co., of which this publication is a part, recently purchased *The Horseless Age*, the first automobile journal published in the English language. And because of the fact that the only other automotive publication which antedated it, a French journal, has gone out of existence since the great war began, *The Horseless Age* could rightly claim to be the oldest one in the world.

The Class Journal Co. has three dominant publications in three distinct fields. Besides AUTOMOTIVE INDUSTRIES, which is devoted to the problems of manufacturing, production and engineering, they are: *Motor World*, which deals with the merchandising and sale of the products of the automotive industry, and *Motor Age*, which deals with the maintenance and use of cars in the hands of dealers and consumers.



THE HORSELESS AGE.

A MONTHLY JOURNAL

DEVOTED TO THE INTERESTS OF THE MOTOR VEHICLE INDUSTRY.

VOL. I. NEW YORK, NOVEMBER, 1895. No. 1.

THE HORSELESS AGE.

E. P. INGERSOLL, Editor and Proprietor.

PUBLICATION OFFICE:

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SUBSCRIPTION, FOR THE UNITED STATES AND CANADA, $2.00 a year, payable in advance. For all foreign countries included in the Postal Union, $2.50.

ADVERTISEMENTS.—Rates will be made known on application. When change of copy is desired it should be sent in not later than the fifteenth of the month.

COMMUNICATIONS.—The Editor will be pleased to receive communications on trade topics from any authentic source. The correspondent's name should in all cases be given as an evidence of good faith, but will not be published if specially requested.

Address all correspondence, and make all checks, drafts, and money orders payable to

THE HORSELESS AGE, 157-159 William Street, New York.

Salutatory.

WE PRESENT to the trade and the public the first number of the HORSELESS AGE, a journal which will be published monthly hereafter in the interest of the motor vehicle. The appearance of a journal devoted to a branch of industry yet in an embryonic state, may strike some as premature, and the somewhat desultory character of this number may provoke criticism in some quarters. But those who have taken the pains to search below the surface for the great tendencies of the age, know what a giant industry is struggling into being there. All signs point to the motor vehicle as the necessary sequence of methods of locomotion already established and approved. The growing needs of our civilization demand it; the public believe in it, and await with lively interest its practical application to the daily business of the world.

In such a condition of expectancy the chief want is news. Not only those directly concerned in the perfection of the new vehicle, but the reading public as well, wish to be informed of the progress of this great mechanical movement; to know the forms or styles in which the new vehicle is to appear, and to examine the claims that are offered, no less than the facts that are accomplished. To satisfy this demand is the work to which the journalist should bend his energies. Criticism, at such a time, may properly be left to the mechanical expert or the intending purchaser. His chosen task is to collect the materials upon which an intelligent judgment may be based.

At this formative period of the motor vehicle industry, exact data are difficult to obtain. All over the country mechanics and inventors are wrestling with the problems of trackless traction. Much of their work is in an unfinished state; many of their theories lack demonstration; but enough has already been achieved to prove absolutely the practicability of the motor vehicle. What is here presented, however, is merely an earnest of what is to come.

The second number of the HORSELESS AGE will contain a detailed account of the *Times-Herald* contest, which is to be held at Chicago on November 2nd, and many new illustrations. In succeeding numbers, topics of importance to the trade will be taken up for discussion. Several projects bearing broadly on the future development of the industry are now under editorial consideration, and will be announced in due time.

The Horseless Age.

It has a fascinating sound, and ere the close of 1895, the idea will have been proved as practical as the sound is fascinating.

It is often said that a civilization may be measured by its facilities of locomotion. If this is true, as seems abundantly proved by present facts and the testimony of history, the new civilization that is rolling in with the horseless carriage will be a higher civilization than the one we now enjoy.

The first page of the first issue of the first automobile journal published in the English language, of which the manufacturing, production and engineering features are now merged with AUTOMOTIVE INDUSTRIES

In November, 1895, the first issue of *The Horseless Age* appeared. It was published as a monthly until March of 1899, when the call for more frequent issues became so great that the publisher put his paper on a weekly basis. Developments were beginning to move rapidly in the automotive field at that time and the editor found it impossible to keep up with developments with his monthly issues.

Even in its earliest days *The Horseless Age* devoted its chief attention to the practical side of the new art. Utility was its watchword and the standard by which it

It has been decided by its owners that they can render the greatest possible service to their subscribers and advertisers by merging *The Horseless Age* with these three publications, which merging dates from this issue.

measured everything. As there were in those days no clearly defined lines of demarkation between what have become special fields within the broader field of things automotive, it was but logical that the early issues of the pioneer publication should have been characterized by a rather broad and, perhaps, somewhat rambling treatment of its general subject. But, nevertheless, there was there, and it was more strongly emphasized as time went on, the inclination to consider first the how and why of everything pertaining to the making and use of the vehicles of the coming age. It was quite natural, therefore, that *The Horseless Age* soon came to be known as the practical paper of the growing industry and later when a goodly part of its space was devoted to discussions of the technical considerations of motor vehicle design that it should have been recognized as the leading engineering and production publication in its line. It was truly an automotive publication, as for many years it covered, besides motor vehicles, farm tractors, motorcycles, motor boats, trucks and aeronautics.

The engineering, manufacturing and production features of *The Horseless Age* are merged with and become a part of AUTOMOTIVE INDUSTRIES with this issue, and under the direction of its editorial staff will increase and develop, and become of even greater value than they now unquestionably are to the automotive industry.

AUTOMOTIVE INDUSTRIES is also a pioneer. It was established, as the AUTOMOBILE, with the organization of the Class Journal Co., in April of 1902 by the merging of *Motor Vehicle Review* and the AUTOMOBILE, both of which publications started in 1899. The merger with *The Horseless Age* will, however, date back its real beginning to 1895. For many years devoted to the engineering and manufacturing side of the automobile industry, its editorial policy has recently been broadened to include the engineering, manufacturing and production of the entire automotive field.

In the 23 years covered by the publications affected by the present merger, the automobile trade has grown from zero to a giant industry with an output capacity of more than 1,500,000 cars a year and a capital investment of over $1,000,000,000. In this same period the Class Journal Co. has developed with a growth no less remarkable and this growth has been the outcome of a real service rendered.

As the publications of the company, surely and steadily, assumed commanding places in their respective fields they have gathered to themselves and to the present company a number of other publications which have in many cases been merged with Class Journal papers in their fields. The publications which have been bought by the Class Journal Co. from time to time are: THE AUTOMOBILE, *Motor Vehicle Review, Dealer and Repairman, New Centaur, Motor Age, Motor Life, Motor Field, The Light Car, Southern Garageman, Southern Motoring,* and *The Horseless Age.*

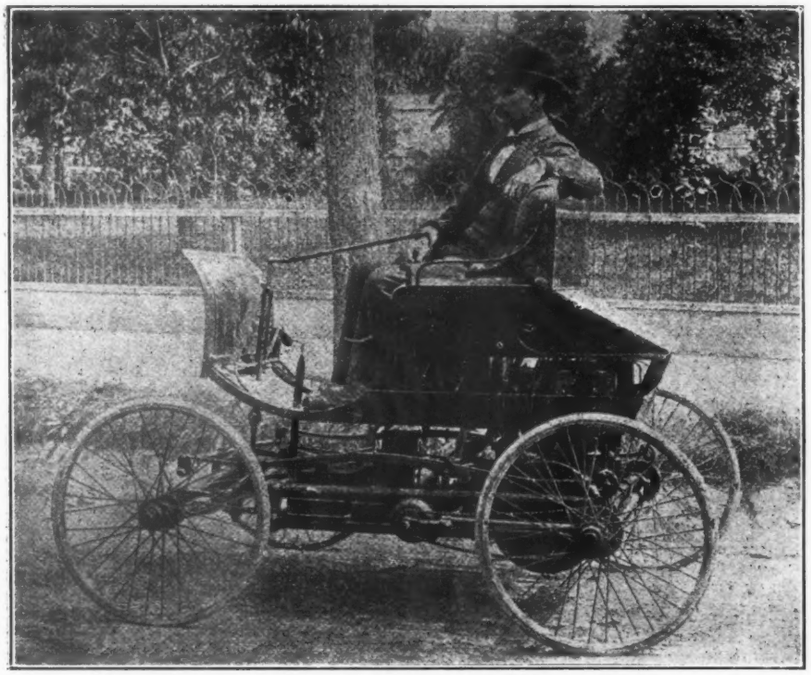
The life story of the automotive industry has been recorded, as in a diary, from its very beginning to the present day, on the pages of the publications which now are a part of the Class Journal Co. At this time of the merger of the oldest journal in the field with AUTOMO-

The Duryea which won the Times-Herald race in Chicago on Thanksgiving Day, 1895, *at an average speed of 7½ miles an hour, was equipped with a two-cylinder motor, 4 x 4½ in., and had a wheelbase of 57½ in.*

In this, his first production (1896), *Alexander Winton used the principle of pneumatic control of engine speed, which was for several years a feature of the Winton line*

TIVE INDUSTRIES it will be interesting and worth while to look back again to the times of the pioneers, to do them the honor that is their due and to consider for a moment the many problems, unknown to-day, with which they were forced to contend.

Without having had the actual experience of the early engineers who worked on the development of their own or someone's else ideas on motor vehicle construction, it is impossible to realize what they really had to contend with. Practically everything that went into the completed machine had to be made by the maker of it himself. Nothing was to be had in the way of already prepared parts, not even wheels or tires, except such as had been designed and made for some other purpose. Makers of those parts which could be adapted to motor vehicle use in most cases, if they did not actually refuse to have anything to do with what they regarded as an intruder into their field, certainly lent no great amount of help to the struggling pioneer.



They called it a "gasoline buggy" and it was made by Messrs. Haynes and Apperson of Kokomo. It was one of the "new models" described in the first issue of The Horseless Age. All of the mechanism was secured to the frame and the body rode independently

Andrew L. Riker worked out his first motor vehicle in 1895 *by using a pair of bicycles. Several years later Riker's company became one of the largest producers of electrics*

In the older lines what had been learned was for the most part what experience had taught, and the rule of thumb handed down from father to son held sway over the formula and the slide rule. The troubles of a would-be motor vehicle builder in this connection are recorded in the following item from an early issue of *The Horeless Age:*

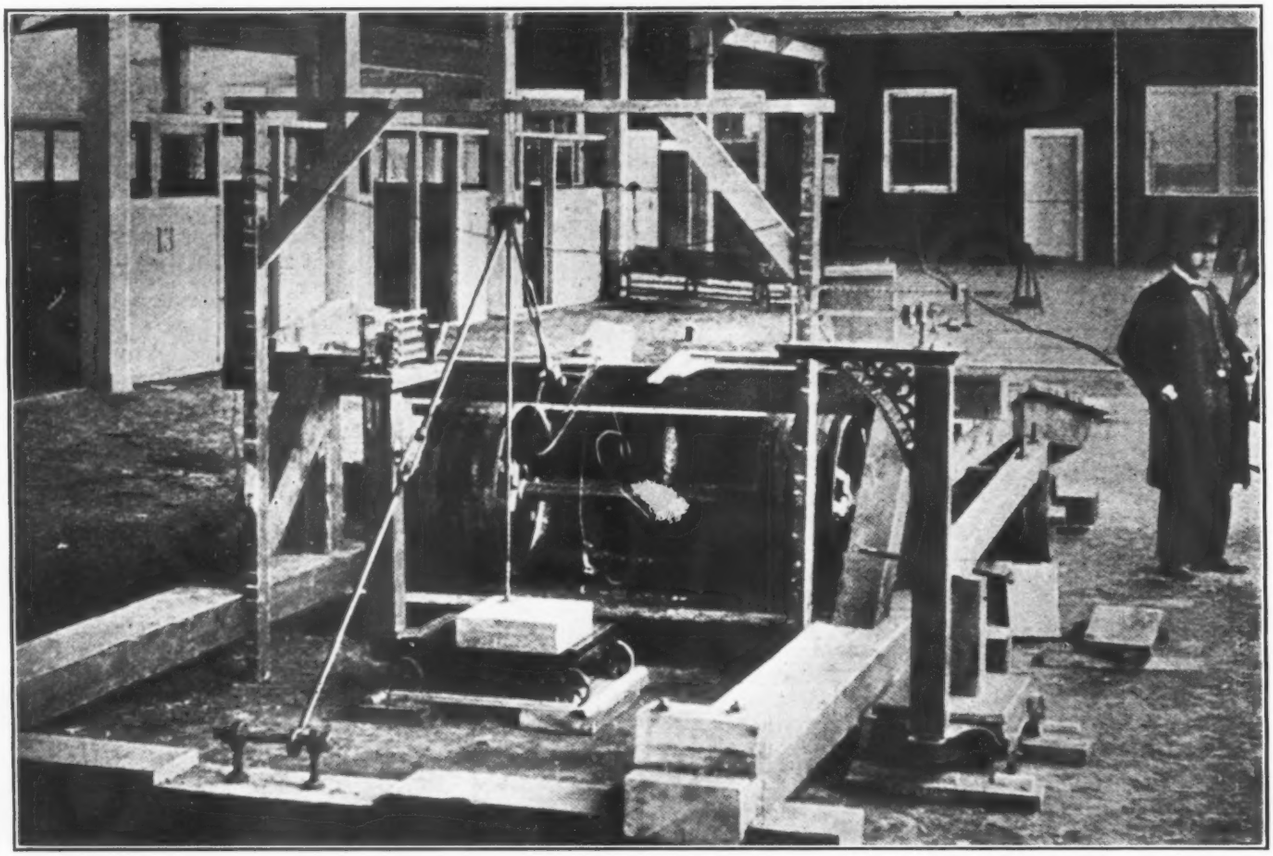
"A mechanical engineer, who has undertaken to construct a motor carriage on scientific principles from start to finish, recently consulted several wheel makers on the proper construction of motor vehicle wheels. He went from one to the other without getting the slightest satisfaction. Some of those approached frankly confessed their ignorance of the subject and others gave him a vast amount of 'experience,' which his own thorough engineering knowledge told him was false. He then went to a number of carriage and wagon builders of reputation, but his search was fruitless there. He was finally obliged to design a wheel of his own, adapted to his purpose.

"The days of the rule-of-thumb mechanic are past. The day of the engineer has come, and if the carriage trade is to do anything in the motor vehicle way, it must begin to study up the text books. Such ignorance of the mechanical principles underlying the craft is inexcusable."

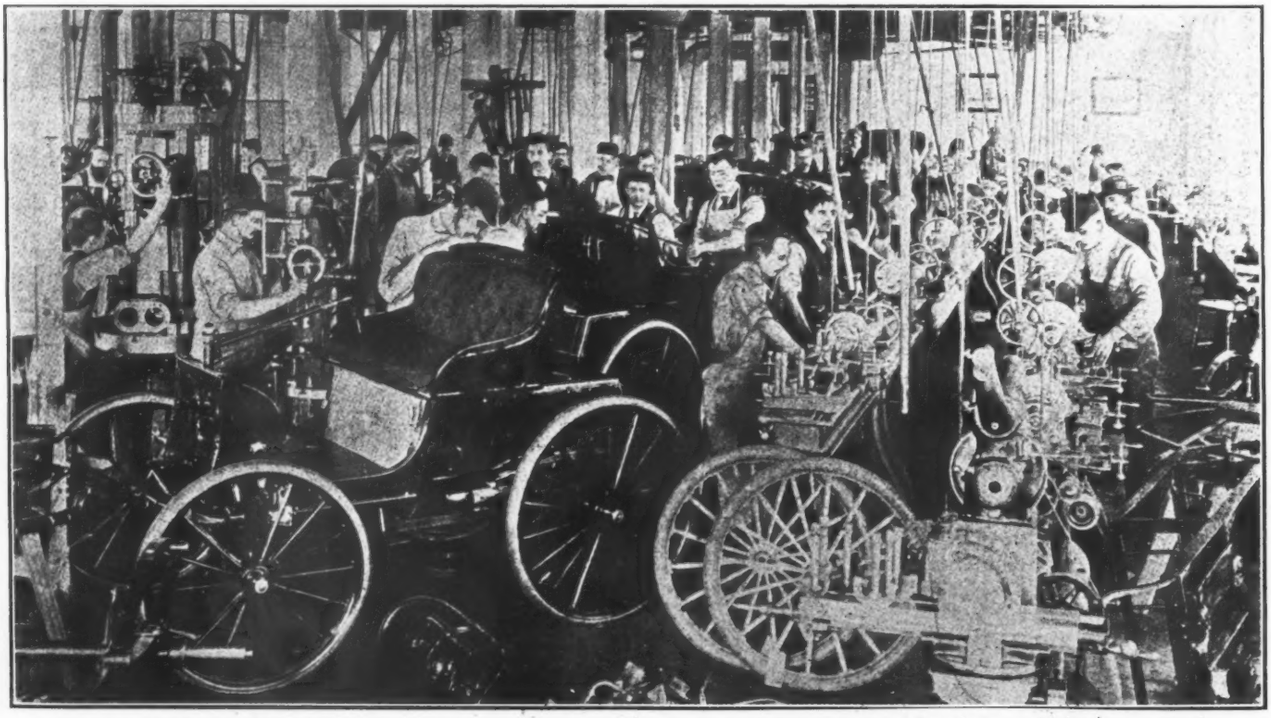
Except in certain noteworthy instances, it required the coming of a new generation of parts makers who appreciated the possibilities of the motor vehicle to change the old order of things and to look at the old products scientifically with a view to their new use.

In these days of assembled cars, put together with parts so well designed and standardized that the possible number of combinations is probably as great as the possible number of hands at poker, it is difficult to conceive of the handicap under which, just for example, the builder of an electric vehicle worked whose labors are recorded on the pages of the earliest automobile journal. He was forced to make his own wheels, which he did of wire; to make his own motor, controller, axles, springs, and even the batteries which supplied, or were intended to supply, the motive power.

It is true that storage batteries were to be had at that time, but they were hardly of the portable type and certainly



The Times-Herald race, which was the first organized speed competition of motor vehicles in this country, provided also the first opportunity to make a comparative engineering study of the vehicles themselves. The very complete apparatus shown above was set up by the technical committee and all competing vehicles were tested out on it. The driving wheels rested on revolving drums operating a dynamometer which measured the horsepower delivered at the wheels of the vehicle. The results of the tests are reproduced on page 1075



An automobile factory of 1895. *A view of the shop of the Duryea Co. in Springfield, Mass., taken when the vehicles for the Times-Herald race were being finished. There seems to have been a very close relationship between the engine making and upholstering departments*

TABLES.

TABLE NO. 2.—POWER AND DUTY TESTS OF MOTOR VEHICLES.

Vehicle.	No. of run.	Speed in feet per minute.	Pull exerted—pounds.	Horse power exerted at rim of wheel.	Horse power consumed in mechanism.	Total horse power developed in cylinder	Mechanical efficiency	Gasolene—pounds consumed per hour.	Gasolene—pounds consumed per horse-power hour at rim of wheel.	Foot pounds at rim of wheel per pound of Gasolene.	Cost per horse-power hour, rim of wheel, cts.	Efficiency. H. P. output. H. P. input.	Heaviest pull exerted —Pounds	Remarks.
De La Vergne R. M. Co., New York. (Benz motor.)	1	619	37	.70	.71	1.41	.50	3.24	4.63	428,000	9.26		162	
	2	1,000	51.8	1.57	1.40	2.97	.53	4.45	2.83	700,000	5.66			
Duryea Motor Wagon Co., Springfield, Mass. (Own motor.)	1	432	83.8	1.10	.59	1.69	.65	4.01	3.64	545,000	7.28		187	Trouble with igniter.
	2	434	88.5	1.16	.59	1.75	.65	3.78	3.24	623,000	6.48			
Haynes & Apperson, Kokomo, Ind. (Own motor.)	1	376	23.1	.26	.61	.87	.30	5.78	21.8	91,000	43.60		119	Two cylinders in use, one only supplying power.
	2	796	39.3	.95	1.28	2.23	.43	5.75	6.04	327,000	12.08			
Lewis, G. W., Chicago, Ill. (Own motor.)	1	353	49.9	.53	.53	1.06	.50	3.29	6.20	319,000	12.40		109	Chain broke.
	2	491	17	.25	.65	.90	.28	3.28	12.8	155,000	25.60			
Macy, R. H., & Co., New York. (Roger-Benz motor.)	1	521	52.1	.83	1.48	2.31	.36	3.22	3.90	515,000	7.80		103.7	Belt Slipped.
	2	945	87.2	2.50	2.68	5.18	.48	4.90	1.96	1,010,000	3.92			
Mueller, H., & Sons, Decatur, Ill. (Mueller-Benz motor.)	1	423	92.1	1.18	.61	1.79	.66	3.50	2.96	669,000	5.92			
	2	540	42.3	.69	.77	1.46	.47	3.87	5.60	354,000	11.20			
	3	564	38.6	.66	.81	1.47	.45	3.77	5.71	347,000	11.42		135.4	
	4	984	73.4	2.18	1.57	3.75	.58	3.40	1.57	1,268,000	3.14			
	5	1,168	34.7	1.23	1.86	3.09	.40	4.15	3.37	588,000	6.74			

Vehicle.	No. of run.	Total H. P. developed in motor.	Electrical input H. P.	K. W. hours supplied batteries per H. P. H. at rim of wheel	Foot Pounds at rim of wheel per K. W. H.	Efficiency.	INPUT. Volts.	INPUT. Amp.	Remarks.
Morris & Salom, Philadelphia. (Lundell motor.)	1	1.12	1.36	1.74	1,138,000	.57	97	10.5	Test ended by trouble with bearing.
	2	2.46	2.90	1.63	1,215,000	.61	96	22.5	
Sturges Electric Motocycle Co., Chicago, Ill. (Lundell motor.)	1	.62	.99	2.42	818,000	.41	35	21	
	2	1.53	1.94	1.70	1,165,000	.59	69	21	

DETAILS AND DIMENSIONS OF MOTOR VEHICLES.

Vehicle.	Weight (light). Driver, pounds.	Weight (light). Steering, pounds.	Weight (light). Total, pounds.	Wheel base, inches.	Gauge drivers, inches.	Gauge steering, inches.	Radius compressed. Drivers, inches.	Radius compressed. Steering, inches.	Position of drivers.	Nature of tires.	Nature of bearing.	Fuel or energy supplied.	No. of cylinders.	Diam. bore cylinder, inches.	Stroke of piston, inches.
De La Vergne R. M. Co., New York. (Benz motor).	1250	430	1680	66.7	.....	.....	23.7	18.2	Rear	Solid rubber	Roller	Gasolene	1	5.12	6.62
Duryea Motor Wagon Co., Springfield, Mass. (Own motor).	729	479	1208	57.5	55	53.7	22.8	18.7	Rear	Pneumatic	.....	Gasolene	2	4	4.5
Haynes & Apperson, Kokomo, Ind. (Own motor).	829	421	1250	54	55.2	55.5	17.8	17.9	Rear	Pneumatic	Ball	Gasolene	2	4	4
Lewis, G. W., Chicago, Ill. (Own motor).	900	780	1680	56	46.6	46.5	22.9	16.7	Rear	Solid rubber	Roller	Gasolene	1	5	5
Macy, R. H., & Co., New York. (Roger-Benz motor)	1440	385	1825	67	52	52	23.8	17.9	Rear	Solid rubber	Roller	Gasolene	1	5	7
Morris & Salom, Philadelphia. (Lundell motor).	1260	390	1650	49	44.2	36.1	19.8	14.2	Front	Pneumatic	Ball	Storage battery	Two motors	.....	.....
Mueller, H., & Sons, Decatur, Ill. (Mueller-Benz motor).	1251	385	1636	73	50.2	47.8	24	18.4	Rear	Solid rubber	Roller	Gasolene	1	5.5	6.25
Sturges Electric Motocycle Co., Chicago, Ill. (Lundell motor).	2085	1450	3535	65	57	57	25.1	23.2	Rear	Solid rubber	Plain	Storage battery	One motor	.....	.....

TABLE A—WHEEL RESISTANCE TESTS.

Number of test.	Nature of Axles.	Nature of tires.	Mean diam. of bearings Inches.	Radius of wheels loaded. Inches.	Weight of pair of wheels. Pounds.	Total load, including wheels. Pounds.	Pull at tire due to axle friction. Pounds.	Total pull at tire, producing uniform motion.
1	Collinge	Steel	1⅛	24.5	68	659	5.4	8.84
2	Ball-bearing	Steel	1¾	21.75	....	452	....	2.86
3	Collinge	Solid rubber	1⅛	18.9	75	657	2.64	5.49
4	Ball-bearing	Solid rubber	1⅛	24.2	....	645	....	2.36
5	Collinge	Pneumatic (inflated). 1¾ inches	1⅛	22.5	67	657	1.78	7.37
6	Collinge	Pneumatic (deflated). 1¾ inches.	1⅛	22.1	67	598	....	10.57

This compilation and tabulation of facts and figures which was made up by the technical committee which tested the vehicles competing in the Times-Herald race contains what is undoubtedly the first collection of detailed motor vehicle specifications ever prepared. Table No. 2 (above) shows the results obtained from the use of the testing apparatus illustrated on the opposite page. Some very interesting comparisons with practices and performances of present day construction may be noted

This Stanley steam car started the first quantity production program in the United States, being the forerunner of a thousand similar cars which were put through in one lot. Work was started in 1897

not capable of propelling a light (?) motor vehicle which weighed no more than 1.5 tons. He cast his own plates, cut them as best he could on a miller, and formed them up after a fashion in a conscientious if not very effective manner.

Duryea made his own pneumatic tires, or rather had them made for him according to his design. He wanted pneumatics and there was no other way of getting them.

It may be mentioned that in the early days there were lengthy and wordy discussions as to what really was the best type of tire for motor vehicles. Steel tires had their ardent advocates, as did those of solid rubber, and there were a few so bold as to suggest that perhaps the air filled rubber tire might possibly become the final type. The editor of the pioneer journal was evidently one of these, as may be judged from the following extract from an editorial:

"One of our correspondents makes a comparison between iron and rubber tires for motor carriages and decides in favor of the former on the ground of their greater durability and cheapness.

"The tire question is a very broad one as related to motor carriages, and our correspondent evidently fails to comprehend its full scope. The durability of the tire is not the only point to be considered. The durability of the vehicle is even more important and no one will contend for a moment that the life of a vehicle is not prolonged by the use of rubber tires. If this is true of an ordinary horse vehicle, how much more so of a motor carriage which contains machinery in constant operation, and should, therefore, be relieved of shock and vibration to the fullest extent of modern science. In this aspect of the case, the rubber tire becomes an absolute necessity for a motor carriage and anyone who adopts the iron tire instead must soon be convinced of his shortsightedness by the more rapid deterioration of the vehicle. Comfort, of course, is another strong point in favor of the rubber tire and so far as cost is concerned it is sufficient to say that we do not look at first cost but at final results."

Note the report of experiments with pneumatics on public cabs in Paris early in 1896:

"Michelin & Co., the well-known pneumatic tire manufacturers of Paris, have attached their new pneumatics to a number of the public cabs of that city with much success, the results showing that if the power required to draw a pneumatic tire cab be represented by 100, the power required to draw a cab fitted with steel tires will be represented by 135 to 156. In addition to the saving in power, there is also a saving in wear and tear, and as vibration is reduced all through the vehicle, it can be built lighter with safety.

"These experiments, it is confidently believed, will lead to the introduction of the pneumatic tire on motor vehicles."

The observations made in the latter part of the above item read very much like the arguments of the present day advocates of the use of pneumatics on motor trucks.

While the problem of parts was an obstinate one in the days of the early builders the problem of materials was even greater. Things that are everyday doings in the realm of automotive engineering to-day simply could not have been done at all in the days when the industry began. Even if the ideas had been conceived, and many of them were in one form or another, they could not have been carried out successfully simply because the materials necessary were not obtainable. In those days steel was steel, bronze was bronze and cast iron was cast iron. Aluminum was rather new and more or less experimental.

As is well known, Europe, and more particularly France, was well ahead of America in the development of special automotive materials, and many an American experimenter soon found, when he attempted to follow European practice too closely, that what would work splendidly when made in France would not work at all satisfactorily when made here. A case in point may be of interest as showing the progress which has been made in the automotive arts in America.

As is recorded in an issue of *The Horseless Age*, and it was not one of the issues of Vol. I, a certain American manufacturer set out, as did others also, to make a duplicate of a well known and most successful French car. He found, before many cars were built, that extensive changes in design were necessary because the materials available here would not stand up under the conditions imposed by the design, and yet the French cars which he brought over, made of parts of identically the same size and shape, performed with entire satisfaction measured by the standards of that day.

The pioneer inventors, while they lacked in the ability, and more particularly in the facilities to work out successfully their ideas as to what self-propelled road vehicles should be, nevertheless did not lack in clearness or breadth of vision or in their conception of the possibilities that lay ahead of them in a realization of their fondest hopes.

Note what the founder of *The Horseless Age* said in his first editorial:

"But those who have taken the pains to search below the surface for the great tendencies of the age know what a giant industry is struggling into being there. All signs point to the motor vehicle as the necessary sequence of methods of loco-

A Lengert motor business wagon which was built early in 1896. *The single cylinder engine had a bore and stroke of* 5⅜ *in. and a special clutch regulated the road speed*

motion already established and approved. The growing needs of our civilization demand it; the public believe in it and they await with lively interest its practical application to the daily business of the world."

And from the pages of a very early issue in 1895 spoke the great wizard, Thomas A. Edison, in wise words of prophecy as follows:

"Talking of horseless vehicles, by the way, suggests to my mind that the horse is doomed, yet this animal shows a greater economy of force than man, for 70 per cent of the energy of the horse is available for work. But the horseless vehicle is the coming wonder.

"Ten Years from Now—"

"Ten years from now we will be able to buy a horseless vehicle for what we would have to pay to-day for a wagon and a pair of horses. The money spent in the keep of the horses will be saved and the danger to life will be much reduced.

"Will these vehicles be run by electricity? I don't think so. As it looks at present, it would seem more likely that they would be run by a gasoline or naphtha motor of some kind. It is quite possible, however, that an electrical storage battery will be discovered which will prove more economical, but at the present the gasoline or naphtha motor looks more promising.

"It is only a question of a short time when the carriages and trucks of every large city will be run with motors. The expense of keeping and feeding horses in a great city like New York is very great, and all this will be done away with just as the cable and trolley cars have dispensed with horses.

"You must remember that every invention of this kind which is made adds to the general wealth by introducing a system of greater economy of force. A great invention which facilitates commerce enriches a country just as much as the discovery of vast hoards of gold."

The very early makers of cars may be divided into at least two distinct classes, for, while all were radicals in the minds of the general public, they were radical in varied degrees. There were conservative radicals and radical radicals. Real progress came through the work of the former group, among whom were such men as the Duryea brothers, Elwood Haynes, Alexander Winton, A. L. Riker, R. E. Olds, Charles B. King and others whose early efforts in the line were referred to in *The Horseless Age* during the first year of its existence.

The Problems of Vehicle Propulsion

The conservatives struggled with the problems of steam, gasoline and electricity, but the radicals sought their ends in, and pinned their hopes on, springs, liquid air, compressed air, acetylene, carbonic acid, compressed gas, ether and even gun powder.

Note this:

"The picture on this page represents a spring motor vehicle which was invented by a Philadelphian. Four powerful springs furnish the propelling force, and it is said the vehicle can make rapid headway on a level road. The springs are scarcely strong enough to make a long run on one winding, and the inventor was so prodigal in the use of gearing as to add unnecessarily to the weight and complication of the machine.

"The machine was recently purchased by a New Yorker, who has undertaken to make such alterations as he thinks will adapt it to the market as a light pleasure vehicle. He hopes to be able to run it at 20 miles an hour and to cover 3 miles at one winding."

And this, which is from a description of an ether-driven bicycle:

"The generator, corresponding to a steam boiler, is a small cylinder running down perpendicularly from the seat. Within this cylinder, which is 3 inches in diameter and 36 inches in length, is a coiled pipe surrounded by asbestos. Stored within are four pounds of ether, which is heated from underneath by burning gasoline supplied from a tank placed in the curved frame that extends from the bottom of the generator to the fork of the front wheel. The vapor so generated is used to operate the engines, which weigh only two pounds apiece without the pistons, yet they are said to be capable of two horsepower each at full pressure and one horsepower each at low pressure."

The Riotte kerosene bicycle, a creation of 1895, *was operated by a mixture of kerosene and air, electrically ignited from a small primary battery. The engine could be attached to any ordinary bicycle*

What must surely be the grandfather of all long stroke motors is discovered in a motorcycle driven by steam. "The engines are 1¾-in. bore, 13-in. stroke," says the descriptive article regarding it.

But all the vehicles of those days were not like these. The more conservative designers built vehicles which embodied practically all of the essential elements of a modern automobile in somewhat more or less crude form. They had the gasoline engine of multiple cylinders, clutches and change gear units in combination usually with some form of chain or spur gear drive.

It may at first seem rather strange, after the very early days in which a majority of the vehicles produced were equipped with engines having two or more cylinders, that there should have been an apparent retrogression to the single-cylinder type as was later indicated by a preponderance of practice.

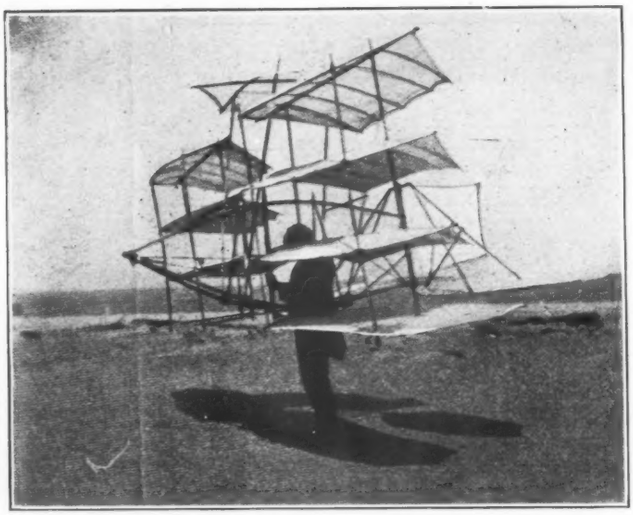
But actually the wheels of progress were steadily moving on. It was not really a backward movement, for it was through the improvement of the details of engine construction resulting in increased power per unit of cylinder capacity and increased smoothness of operation that it became possible to drop off the extra cylinders in order to attain the greatest simplicity.

Ideals of Pioneer Designers and Builders

The standards of perfection to which most of the old designers and builders worked and the hopes of ultimate attainment which they nourished were naturally much farther down the scale of possible achievement than are those of the builders of the present day. Standards constantly rose and the wildest hopes of the pioneers soon became out of date and superseded practice under the stimulus of public demand and the competition to meet it.

But the ideals of some were not so far behind those of the present day as is evidenced by the following extract from an article on "Motors and Fuels" by Hudson Maxim which appeared in *The Horseless Age* early in 1896. It set forth the requirements of a vehicle motor as follows:

"That motor will be most successful which will come the nearest to fulfilling the following requirements: Lightness—It must not weigh more than 10 and ought not weigh more than 5 to 7 pounds to the horsepower. It should be practically noiseless in its operation and cause a minimum of vibrating



One of the pioneers of the airplane of to-day. This gliding machine was fitted with an automatic regulator to counteract the effect of gusts of wind. Its extreme dimensions were 14 x 6 x 8 ft.

A glider of twenty years ago, shown at the start of a 300-ft. flight. The speed capacity of the machine was doubtless dependent on wind conditions, but it was described as being "from 12½ to 60 m.p.h."

disturbance. It should be adaptable to the use of all kinds of liquid or gaseous fuel, especially gasoline, kerosene and crude petroleum, and also acetylene when that substance can be had at a sufficiently low cost to be available."

It is only of comparatively late years that there has been an appreciation of the actual amount of horsepower that can be used to good advantage in a motor car. Under-powering was a common fault for a long time, and it is not surprising therefore that the first builders of cars underestimated the amount of power required to accomplish what they tried to do. It was hard to distinguish between horseflesh power and mechanical horsepower. We are having the same trouble now, to some extent at least, in the tractor field, and it was this confusion of horses and horsepower which made such articles as the one which we quote below as instructive then as they are interesting now.

Said the writer of the article referred to:

"We have thought of the horse when we made a 2 horsepower motor and considered it as powerful as two horses. This might be true at a speed of seven miles per hour or a mile in nine minutes, but as soon as the speed is reduced below this the horse is enabled to exert more power in available work and in starting the load he can exert practically all his power. It is evident that the power of a horse is much greater than a nominal horsepower of the motor at slow speed, as on bad roads, in hill climbing or in starting the load.

"Experience proves that we have underrated the available strength of the horse and that an 8 horsepower motor is necessary to draw a load that two horses usually draw."

And this article was printed in 1897, two years after the founding of *The Horseless Age*.

In perusing the pages which form the record of activity in the industry twenty years ago, one apparently meets some recent acquaintances in the arguments pro and con, exchanged in the battle of the cylinders which began then, died out a while and were renewed on each occasion with the coming of the six, eight and the twelve.

The single cylinder epoch in motor car making extended, roughly, from 1899 to 1903 or 1904, at which time the advocates of "useless complication" had made so much headway with their theories that they had succeeded in getting them into actual practice.

Europe was ahead of us in the development of multiple-cylinder engines as she was in the production of special materials, and the "four" was pretty nearly standard in France before it was much used either here or in Great Britain. Its adoption in this country was by no means spontaneous, as is clearly shown in the printed records, and some of our well-known makers floundered around a good deal in making the change, meanwhile publicly building up elaborate arguments to show the logic of the older order of things while privately carrying on experiments which merely led them eventually where they were bound to go if they were to keep up with the procession. Some of them will probably admit to-day that the necessity to revamp their arguments caused them no little embarrassment, which in most cases they sought to cover up by profuse explanations to the effect that at last they had accomplished that which no one else had been able to do.

How the six followed the four, and the eight and twelve followed the six; how the sliding type of gear unit all but crowded the planetary out of use; how the progressive system of gear changing gave way to the selective; the story of the conflict of the clutches; the death of the starting crank and the coming of electric starting and electric lighting; the development of special materials for motor car use; the complete history of the automobile and the great industry which has grown out of it has been recorded from the earliest to the present day on the pages of the publications of the Class Journal Co.

And with the industry the Class Journal Co. has grown. The infant publications of the earliest days of the motor vehicle are now the full-grown helpers of the industry of to-day. They have developed as the trade has grown. They have increased in both the ability and the desire to be of practical aid to those whom they so gladly serve.

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Consolidated Machine Co. Oil Cup

THE Consolidated Machine Co. of Detroit has brought out an oiler or oil cup which operates automatically. The oil cup is provided with a half valve which is opened by the vibration due to the motion of the car. This ball valve checks the flow of oil when the car is at rest, but maintains a flow when the car is in motion. Inasmuch as the opening action on the ball valve will be more or less in proportion to the vibration of the car, the oil will flow more copiously as it is needed in cases of higher speed, or rougher roads.

The construction of the oil cup is simple and it is made up in various exterior shapes with the same internal characteristics. The little ball valve is held within an internal cup which keeps it seated, except when the motion of the car shakes it about to a sufficient degree to permit the oil to escape past the valve into the wick feed leading to the bearing. The Consolidated Machine Co. has started production on a large scale and is equipped to meet demands from passenger car and truck manufacturers.

CAPTAIN GEORGES GUYNEMER
France's Greatest Ace

The Life Story of the Distinguished French Aviator Who Had Accounted for More Than 100 Enemy Fliers

Part II

By W. F. Bradley

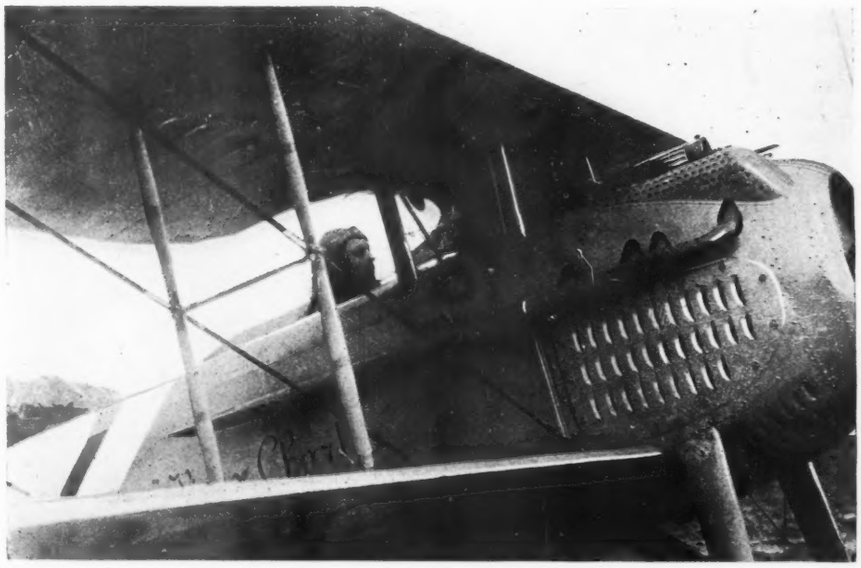
THE fiftieth plane constituted a record which a few months before it had appeared impossible to attain. The actual number of enemy planes destroyed is certainly considerably greater, for unless it was proved that the plane had actually crashed to the ground and been completely destroyed the case was not allowed by the authorities. Many of the fights taking place over the enemy's lines, and at heights of 10,000 to 15,000 ft., it was frequently impossible to ascertain if what at first appeared to be a giddy fall could not be corrected into a glide with a comparatively normal landing.

Persistent ill luck followed Guynemer during the last few weeks of his life. After bringing down fifty-one machines he was recommended to retire and occupy himself with the construction of airplanes. Further, the doctor stated that he was wearing out his nervous system, and counseled a complete rest. But the fever of activity burned within him to such an extent that not only did he refuse to go to the rear, but he declined the opportunity given him to rest for a while.

Early in September Captain Heurteaux, the only man who had any control over impetuous Guynemer, was wounded with an explosive bullet in the thigh and had to be sent to the rear. The day after this loss Guynemer went out, flew for an hour, caught sight of a German, attacked him at close quarters, then had to let him go because of his machine gun jamming. Out again, he attacked five single-seaters, but by clever maneuvering they managed to get away. Guynemer had then been in the air 2½ hours. He went out again, scouring the skies for an enemy machine, and for another 2½ hours cruised around in the hope of a fight. Total flying for the day 5 hours.

On the last day but one of his life Guynemer went out three times, and three times was obliged to come back owing to some slight accident. He had a Spad machine fitted with two machine guns and driven by a Hispano-Suiza engine. On the first flight his water pump shaft seized, obliging him to make a landing on a Belgian airdrome. While his machine was being prepared, he took Deullin's airplane and with it attacked a group of four Germans. This time he was hit by four bullets, one of which went through the gasoline pressure pump, obliging him to land immediately and return to his ground by automobile. A few minutes later he was out again on a borrowed machine. The cover of the carbureter float chamber became unscrewed, the gasoline overflowed and the machine took fire. Another forced landing had to be made, although the fire was put out while gliding down.

All this doubtless had an effect on Guynemer's nervous system, for he was unable to support inactivity or nonsuccess. On Sept. 11 he went out alone and never returned. He had come through so many dangers that it was impossible to believe he had succumbed in turn.



Left—Georges Guynemer in his "Vieux Charles." Right—Marc Birkigt, designer of the Hispano-Suiza engine

Nieuport fighting plane used by Guynemer in 1916

But when evening passed into night and night passed into morning without the search parties or the telegraph inquiries bringing any news, the fact had to be recognized that he was lost. Exactly how he was brought down is somewhat obscure. He was buried near the German front line position; but on the following day the British heavily bombarded this position, then advanced, and all trace of grave and airplane was lost forever.

Georges Guynemer was the first to admit that his success was primarily due to the men whose machines he flew. He began his fighting career on a Morane-Saulnier parasol, designed by Engineer Saulnier in conjunction with Aviator Morane, and equipped with the Gnome rotary engine conceived and built by the Seguin brothers. Later he took the Nieuport biplane, but had his most crowning victories with the Spad biplane, driven by a Hispano-Suiza engine.

Deperdussin Machines

About eight years ago Armand Deperdussin picked out an unknown engineer of the name of Bechereau and instructed him to design and build airplanes to be introduced to the world as Deperdussin machines. Bechereau, being an engineer of considerable genius, had no difficulty in producing machines far in advance of anything brought forth up to that time. Deperdussin was a man of remarkable business ability, who, with such an engineer as Bechereau, gained a leading position in the French aeronautical world, and made his "Dep" machines famous the world over. Unfortunately Deperdussin had started his wonderfully successful business career by methods which would not stand the searching gaze of Justice, and the outbreak of war found him in prison on charges of forgery and abuse of confidence, while his apparently successful aviation business was brought to a sudden stop. In ordinary times the Deperdussin business probably would have been scattered to the winds. But France was at war with Germany and could not afford to disband the finest airplane factory in Europe and to lose the services of the best group of airplane engineers. Thus the Deperdussin company became the Spad company, with engineer Bechereau at its head.

But the Spad airplane was not complete until it received the Hispano-Suiza engine, and the story of how the engine came into existence is one of the romances of the war. Nearly twenty years ago Marc Birkigt qualified as a mining engineer in one of the technical schools of Lausanne, Switzerland, and accepted an appointment with a mining company near Barcelona, Spain.

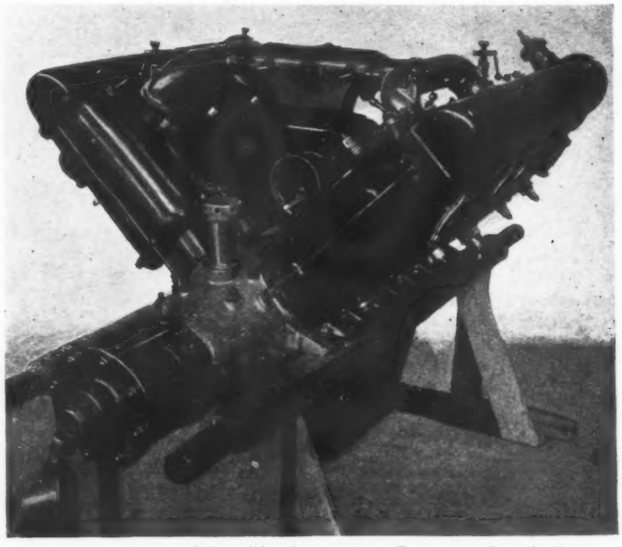
Birkigt displayed considerable ingenuity in the designing of special machinery required in the work of the Spanish mines. He had no connection with the automobile industry and was only interested in automobiles as a user of various European machines, all of which failed to give satisfaction on the atrocious Spanish roads.

One of the directors of the company suddenly proposed at a board meeting: "Suppose we ask Birkigt to build us an automobile which will stand up under Spanish conditions." Birkigt, consulted on the matter, agreed to build a car, and a series of seven was put down for the use of the directors of the company only. The car proved to be a real success. It was presented to the King of Spain, who saw in this private enterprise not only a car which he would like to possess, but the possibility of establishing an important national industry. In consequence, an automobile factory was erected at Barcelona, and the car was put on the market as the Hispano-Suiza, or, to translate it into English, the Spanish-Swiss.

In 1906 the Hispano-Suiza chassis was exhibited on one of the smallest and most insignificant stands of the Paris Automobile Salon. Perhaps it would have returned across the frontier unnoticed and unappreciated but for the discriminating eye of Charles Faroux, one of the cleverest and most open-minded of automobile engineers and journalists to be found in France. Faroux, recognizing in this car the touch of a master mind, sought out Birkigt and convinced him that such a car should be built in France. The consequence was that some abandoned street-car sheds in the suburbs of Paris were secured as an automobile factory and the Hispano-Suiza was produced on a small scale on French soil. Faroux, who has always been a strong believer in the value of automobile racing, succeeded in interesting Engineer Birkigt in speed contests for cars of limited cylinder capacity. For two years the Hispano-Suiza team, with the late Paul Zuccarelli at its head, beat all comers, including Peugeot.

By 1913 the Hispano-Suiza company had secured a leading position in Europe and was absolutely swamped with orders, despite the fact that it had abandoned the street-car sheds for a modern factory just outside Paris.

Then war broke out. The French Government had

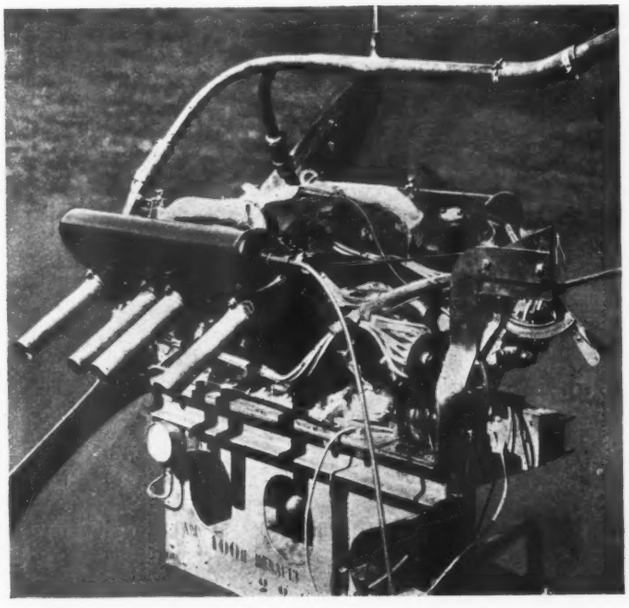


Hispano-Suiza engine used in Guynemer's Spad biplane

no need for a car designed by a Swiss, controlled by Spaniards, and built in a Paris factory. With the German armies marching on Paris, civilians were not exactly tumbling over one another in their desire to purchase touring cars. Thus, having nothing to do, the factory was closed, and Engineer Birkigt returned to Barcelona to await the end of the war—so he imagined. When the danger of the Germans capturing Paris had been averted, the Gnome company secured a lease on the idle Hispano-Suiza factory and used it for the production of their rotary-type motor.

Although the French led the world in aeronautics, the war found them without a single good fixed-cylinder, water-cooled aviation engine. The Gnome and Le Rhone, both air-cooled rotaries, were satisfactory up to a certain point. Renault had an air-cooled, eight-cylinder which was reliable and limited in power. And that was all. Before the end of 1914 several Mercedes six-cylinder, water-cooled aviation engines had been captured, and were given out to Renault, Lorraine-Dietrich, and others, to be copied; but successfully to duplicate their engines required almost a year's work.

Having nothing better to do, Birkigt occupied his idle time toward the end of 1914, at Barcelona, in designing a light-weight, fixed-cylinder, water-cooled aviation engine. The maximum power in any one engine then appeared to be 150 hp., and the eight cylinders were therefore designed with a bore and stroke of 120 x 140 mm. The first engine built gave such good results that news of it penetrated the Government offices in Paris, where the problem of aviation engines was causing grave concern.



Hispano-Suiza engine as fitted to Guynemer Spad

Hispano-Suiza engine on test bench on top of the Alps

Major Martinot-Lagarde, as the leading army airplane motor expert, and two other officers were sent to Barcelona to investigate. They reported that it was a wonderful engine, but admitted that they were scared at the bold design. In consequence, Marc Birkigt was informed that the Government would consider the purchase of the engine if it could successfully pass a 50-hour full-load test. The engine was brought to Paris, erected in the army laboratory, and run for 50 hours under load with very satisfactory results.

Immediately an order for 50 was planned, followed shortly afterward by very important contracts, and then by instructions that other factories should take up the manufacture of Hispano-Suiza motors. From the day he made his first drawing in the shops at Barcelona to the date the first engine was put under power exactly three months elapsed. During those three brief months Marc Birkigt laid the foundations of a fortune which up to the present date has netted $20,000,000. Run for the first time in March, 1915, the number of Hispano-Suiza motors which had actually been in the air by January, 1918, exceed 40,000. Eighteen firms in France have secured licenses to build this engine, while other licenses have been given out to England and to the United States. On every motor built in the Hispano-Suiza shops Marc Birkigt was paid a royalty of $600. Every licensee pays a royalty of 10 to 15 per cent of the selling price of the engine to the parent concern, and on each motor built outside the inventor secures $200.

Designed to meet the requirements of early 1915, which were for a maximum power of 150 hp., the Hispano-Suiza was a complete success. The fact that it was designed, built, produced in series and made the leading motor of the French army in much less than six months is ample evidence of the complete soundness of the design. When flights at high altitudes became common it was found necessary to increase the compression to overcome the loss of power due to the decrease of atmospheric pressure. This was successfully accomplished. After twelve months' service the call was for more power, and Engineer Birkigt was asked to increase the motor speed and gear down the propeller. This was done, allowing

220 hp. to be obtained, although the engine was never as reliable as the original one with the direct propeller.

Before he was captured by the Germans, Roland Garros devised a system of firing between the blades of the propeller. When the geared-down propeller was adopted Engineer Birkigt improved on this by firing through the propeller hub. The Hispano-Suiza motor is an eight-cylinder V-type, the cylinders being an aluminum casting with steel liners. Engineer Birkigt does not claim to be the first man to make use of aluminum for cylinders, this having been done experimentally in France years before, and at least one aluminum engine was built commercially in the United States at the time the French aviation engine was produced. Originality is claimed, however, for the method of screwing the liners into the cylinders. Another original feature is the direct operation of the valves, without the use of any follower between the cam and the valve stem, thus getting not only a better valve opening but decreasing the number of parts. Compared with a motor of the Mercedes type, the number of parts is 900 for the German to 400 for the French.

The amount of raw material that is required to produce a Hispano-Suiza motor is exactly one-third less in weight than that for a motor of the Mercedes type. The value of this does not lie primarily in the lessened cost for material, but in the reduced cost of production by reason of the smaller amount of machining. Unlike many prominent designers, Engineer Birkigt does not seek merely to produce a beautifully finished article but always keeps in view the methods by which that article will have to be produced. He makes his own tools, and many of the machine tools built by American machine tool manufacturers are to his designs.

Progress in the Employment of Female Labor in England

FOLLOWING is a brief summary of work in the automotive industries in Great Britain which was carried out partly or wholly by male labor before the war, in which female labor is now employed. This is taken from an appendix to a paper on "Labor in Engineering Factories" by Ben H. Morgan, read at a recent meeting of the Institution of Mechanical Engineers.

Aeroplanes.—The employment of women on covering, doping, painting and varnishing planes, ailerons, tail-planes, rudders, etc., has been general, and in many cases the work is done entirely by women.

The woodwork of aeroplane wings, ailerons, tail-planes and many subsidiary details has been done throughout, with the exception of machining, by women in many cases.

Women Do Assembling Work

The work of assembling wings, ailerons, tail-planes and details is done in many cases by women, but the erection of fuselages as sides, and the complete assembly of fuselages by women is rare, as also is the assembling of wings and the fitting of controls. The employment of women in higher grade work of this kind has been influenced by local conditions of management and by method, particularly where assembling is performed by a large number of highly specialized gangs, as is the case in a few of the larger works.

Airships, Balloons, etc.—The employment of women is partial, but comprises a very large percentage of the total workers, and their employment is frequent in this industry.

Ball Bearings.—A large proportion of this work was done by women before the war, but the percentage has increased considerably throughout this industry.

In all the preceding cases the work is of such light character and so free from special conditions that no changes have been necessary except the usual improvement in guards where machinery is used.

The period of training required varies from two to six weeks before the women workers can be considered efficient under preliminary conditions, with adequate supervision, and some assistance from skilled workers.

Internal-Combustion Engines.—On the construction of the various parts of the engines for motor cars, motor trucks and aircraft, as well as on gas and oil-engine parts not too heavy to handle, the employment of women is partial and frequent, but on gas and oil-engine parts too heavy to handle, involving increased labor and special lifting tackle, the employment of women is partial and rare, and the work cannot be considered as suitable for them in normal times.

Motor Trucks, Cars and Motor Cycles.—The engines and transmission gear, as well as other components, are frequently made partially by women. The period of training varies from one to six weeks, and requires ability to work to gage. Work on the chassis of cars and trucks is of rarer occurrence and is not considered suitable for women in normal times. The period of training required is from six to ten weeks, but the work is generally considered rather too heavy. On magnetos, carbureters and speedometers the work is in some cases now more than half done by women, and is eminently suitable for them, requiring no change of method or machinery but considerable accuracy and care. The training period varies from three to ten weeks.

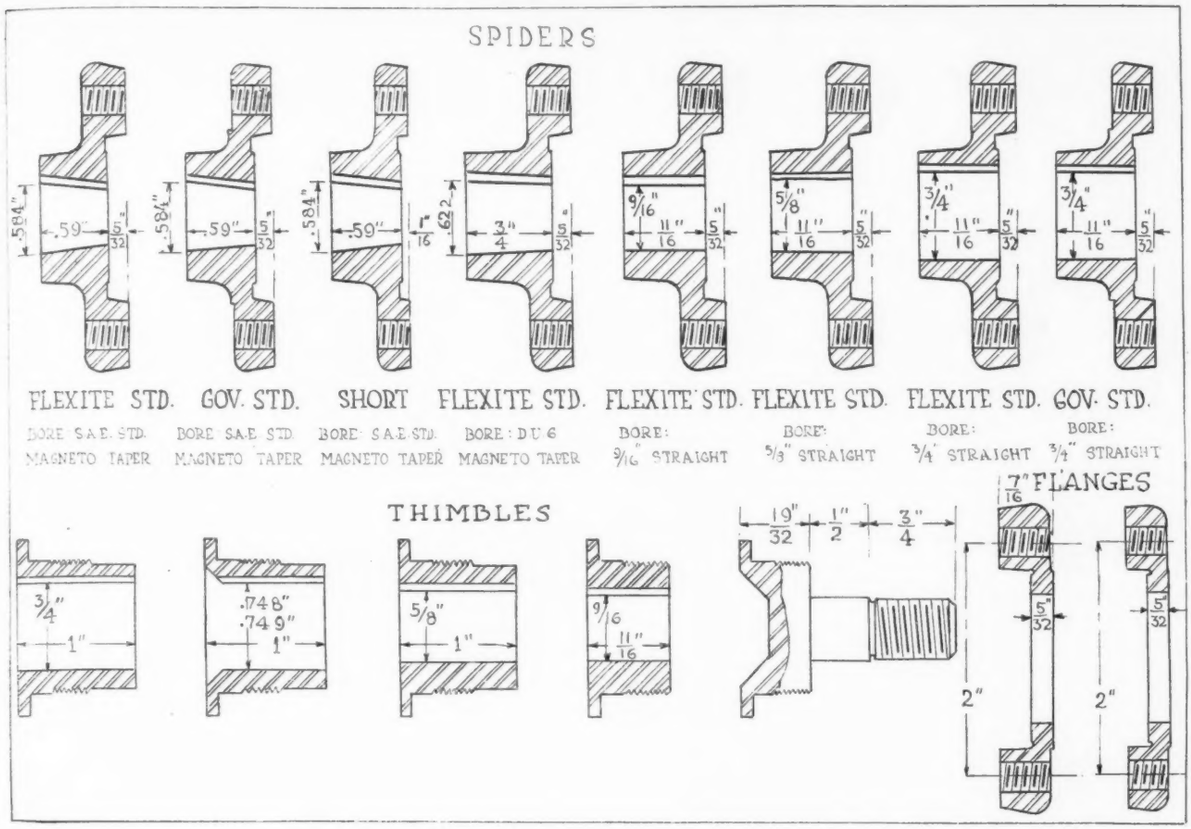
Body Work Too Heavy

The body work of motor trucks, motor cars, as well as upholstering and trimming, is not considered suitable for women, nor have they been employed on these for the reasons that the carpentering on truck bodies is considered too heavy, and the coach making thought to require so much skill that in general it would not pay to employ women on this class of work. The objection to women upholsterers and trainers is peculiar, as they have done this work successfully on railway coaches.

Blueprinting and Tracing.—The partial employment of women is general. It is considered suitable for normal times. Care and neatness are the chief requisites, with a training period of from one week up.

Draftsmen (Junior).—The employment of women is here more rare, but it is work considered suitable. Knowledge of machine-shop work is necessary, and the training involves that for tracing and blueprinting, as well as additional experience in drawing and projection. The need for shop experience is great, but the difficulty attendant on the employment of women in this branch is diminishing owing to the increase in the number of works in which women have been employed in working from actual drawings, and not on mere repetition.

CHARLES L. LATIMER, Fort Wadsworth, N. Y., has applied for a patent on a power-operated valve grinder which can be connected by means of a flexible shaft to any source of power. The mechanism of the grinder comprises a crank and connecting-rod, rack and pinion. It has a telescoping cylindrical casing which fastens by means of hook bolts to the cylinder valve pocket. By means of the telescoping casing adjustment can be made for different heights of gas passages. The valve engaging head comprises a centering device and adjustable driving pins covered in a patent previously issued to Mr. Latimer. This feature makes it possible to grind valves with pinholes any distance apart.

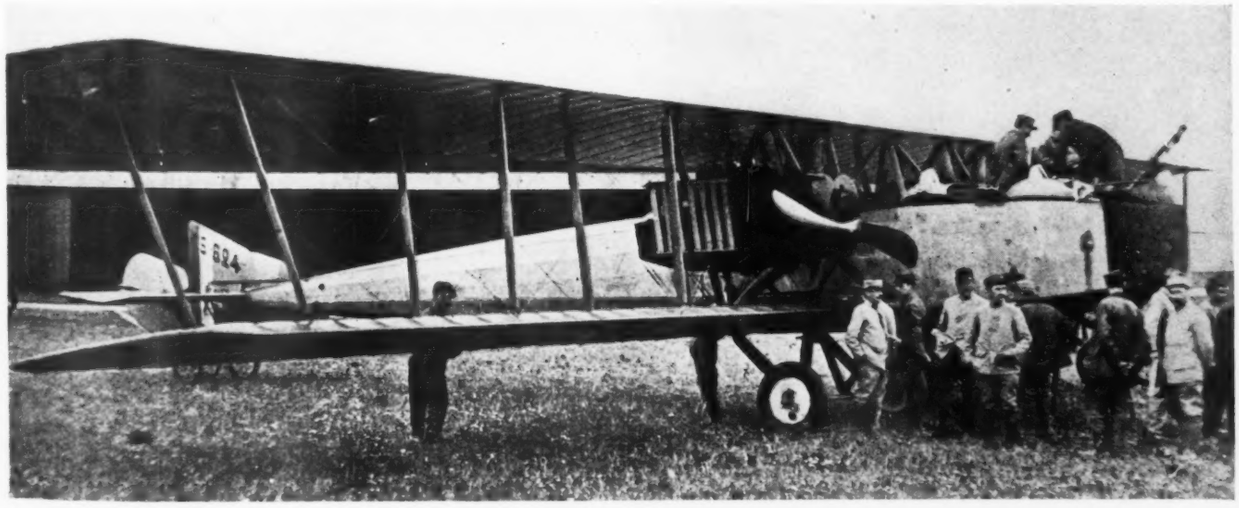


Fittings for Magneto, Pump and Generator Couplings

WHILE magneto shaft ends were standardized by the S. A. E. years ago, manufacturers of magneto couplings have found a wide variation of practice among engine manufacturers with respect to magneto drive shaft ends and methods of securing the coupling to the shaft. This resulted largely from the practice of engine manufacturers of using such couplings as their own shop could most conveniently turn out. In addition to the variation in shaft sizes and methods of attachment, there has been a very considerable variation in the distance between drive shaft and magneto.

The problem, therefore, of carrying in stock magneto couplings to meet the requirements of practically any manufacturer necessitated either carrying a great number of sizes and types or else of producing the design to a unit basis. This latter plan was adopted by F. R. Blair & Co., Inc., New York, and has been successfully worked out by them with a comparatively small number of parts, so they are now able to supply magneto, generator and pump couplings for any new motor which may be designed.

The accompanying illustration shows all the different designs of spiders, flanges and nipples standardized by the firm, and by means of these a great many different couplings can be assembled. Only one size of flexible disk is used, but three lengths of driving screws together with the several designs of spider arms permit of allowing for differences in the distance between shaft ends.



Morane bombing plane, one of the latest types of large bombers used by the French

The Renault 400-Hp. Aircraft Engine

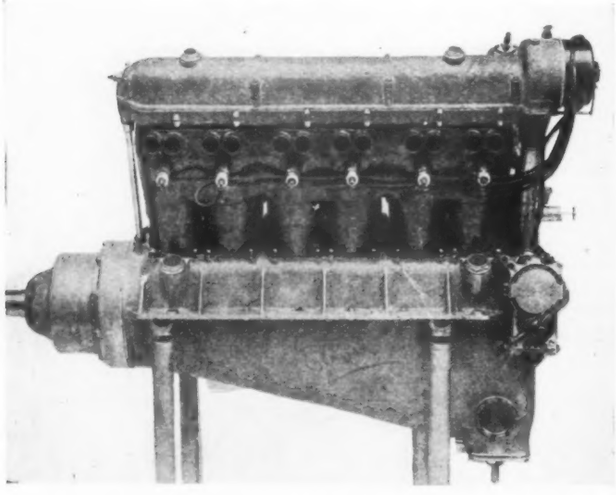
Of the More Substantial Type Used for Bombing and Combat Planes—Built-Up Steel Cylinders and Overhead Camshafts

ONE of the largest aircraft engine plants in France and in the whole world is that of Louis Renault at Billancourt, near Paris. Mr. Renault needs no introduction to readers of AUTOMOTIVE INDUSTRIES, as previous to the outbreak of the war he had achieved an enviable record in the automobile industry as manufacturer of both passenger cars and trucks. Aviation development attracted Louis Renault from the very beginning, and in 1909 he turned out his first aircraft engine, an air-cooled model of 70 hp. This was followed by an 80-hp. model later the same year. In 1912 Renault turned out his first water-cooled aircraft engine, of 150 hp. The following year saw his first 12-cylinder engine, of 200 hp. In 1914 this engine was re-designed and the output increased to 270 hp. In 1915 a representative of the U. S. Signal Corps was sent to France and brought back with him the first Renault aviation engine ever seen in this country. The next year the Renault engineers developed a 300-hp. engine, and in 1917 a 400-hp. model was brought out which is now in production. This latter, by the way, weighs less than 2 lb. per horsepower.

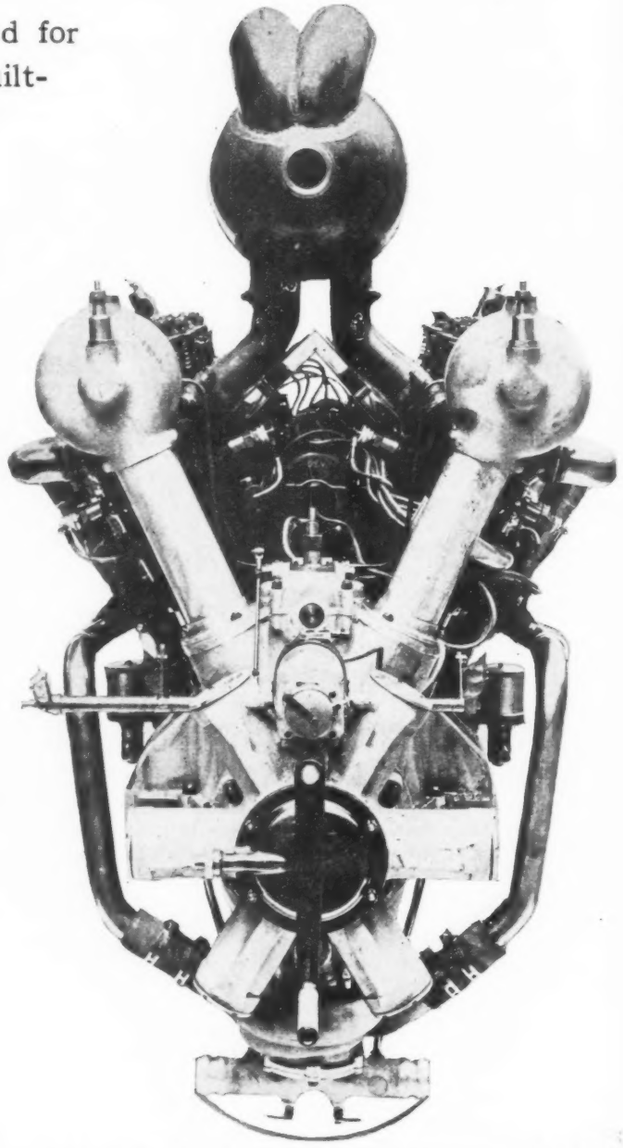
To date Renault has delivered over 15,000 aviation engines to the French, British and Allied governments. There are one hundred air squadrons in each army equipped with Renault engined planes. General Pershing has bought 1500 engines of this make.

Complete airplanes of the Breguet type are also being manufactured under license in the Renault plant. These, of course, are fitted with Renault engines, and the whole machines are being built complete in the Billancourt works. The planes for General Pershing are being made under the supervision of Pershing's men, who are in the plant all the time.

Several notable flights with Renault engined planes have been made in this country recently, including one by M. Tulasne, chief of the French Aircraft Mission in this country, from New York to Washington and back in 9½ hr. The trip was made in a Breguet biplane equipped with a 300-hp. engine. Only a short time ago another large biplane with a Renault engine, carrying Lieuts. Flachaire and Vanel, created considerable attention by circling over New York City on the occasion of Lieut. Resnati's funeral.



400-hp. twelve-cylinder Renault engine



Front view of 400-hp. engine with all accessories fitted

Considerable pride is being taken by the Renault firm in the fact that it was the first to bring out an acute angle Vee engine for aircraft. As is well known, the conventional 12-cylinder engine has its cylinder blocks set at an angle of 60 deg., this being the angle insuring uniformly spaced explosions. The Renault engine has its cylinders set at an angle of 47½ deg. A closely similar practice is followed in the Liberty aircraft engine, which employs a 45-deg. Vee. The object in making the angle of Vee so small is to reduce the head resistance.

Renault engines are used for various classes of aircraft, including training planes, bombing planes and combat planes. These engines are of the sturdier class and are not used in the scouts and similar types of machines which require en-

gines of the very highest weight efficiency without so much regard to reliability or durability. As an indication of the growing endurance of aircraft engines it is interesting to note that the service period of Renault aviation engines before they are subjected to an overhauling has been increased from 120 to 200 hr., and this is believed to be the longest consecutive service period of any aircraft engine.

As the new 12-cylinder, 400-hp. Renault engine is one of the largest aviation engines ever built, a detailed description should prove of interest. The cylinders have a bore of 125 mm. and a stroke of 160 mm. (4.92 x 6.30 in.).

The cylinder water-jacket completely surrounds the exhaust valve guide. There are two valves for each cylinder of 66 mm. (2⅝ in.) diameter. The valve port is 61 mm. (2 13/32 in.) and the inlet to the elbow 53 mm. (1 3/32 in.) in diameter. The valve stems are both 11 mm. (7/16 in.) diameter, with a head approximately 5/32 in. thick and a 45-deg. seat ⅛ in. wide.

The end of the valve stem is threaded to carry the spring cup and lock nut. Each cylinder barrel and head is machined from a forged bar, after which the intake and exhaust elbows are welded on, and finally the pair of cylinders is incased in a jacket which is welded from three pieces of steel about 1/32 in. thick. The cylinder walls themselves are 3 mm. (7/64 in.) thick. A standard two-bolt flange is used for all intake and exhaust port connections and has been profile-milled out of steel. The flanges are screwed on the cylinders and welded and brazed on the intake and exhaust pipes.

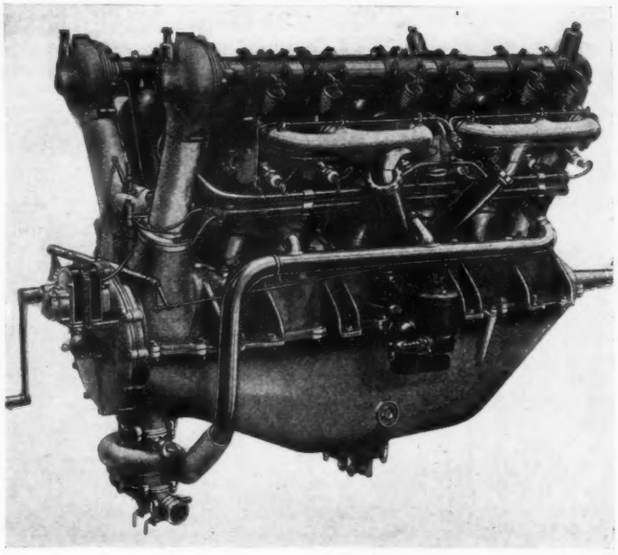
Aluminum Pistons

The pistons are of aluminum. They carry three concentric rings which are pinned at the ring gap. There is a deep annular rib between the piston bosses. The pistons are also unusually short, only 95 mm. (3¾ in.) in length. The piston pin is 38 mm. (1½ in.) in diameter, has a ⅛-in. wall and is locked with a single set screw and cotter pin. There are eighteen 11/32-in. holes drilled in the skirt for lightness and for oiling purposes.

The connecting-rods are of the Renault yoked type, and the short rod alternates from right to left cylinder from the front to the back of the engine. The rods are made of B.N.D. steel, I-beam section, with flange and web 2 mm. thick. The flanges are 26 mm. (1 3/64 in.) and the web is 34 mm. (1 11/32 in.) wide. In the short connecting-rod both ends of the rod are alike. The length of the rod is 300 mm. (11 13/16 in.). The rod cap is secured by means of three bolts, two of 11 mm. (7/16 in.) diameter and one of 14 mm. (9/16 in.) diameter.

The crankshaft is carried in four babbitt-lined bronze shells, which in turn are secured to ribbed-steel bearing caps.

The bearing caps are secured to the top of the case by means of long U-bolts, such as are sometimes used on automobile spring-saddles. The crankshaft has a diameter of 60 mm. (2 23/64 in.) throughout, with the exception of the propeller shaft-end, where the diameter is increased to 68 mm. (2 43/64 in.). The crankpins and main bearings are 72½ mm. (2 55/64 in.) long with the exception of the propeller end bearing, which is 92 mm. (3⅝ in.) long.

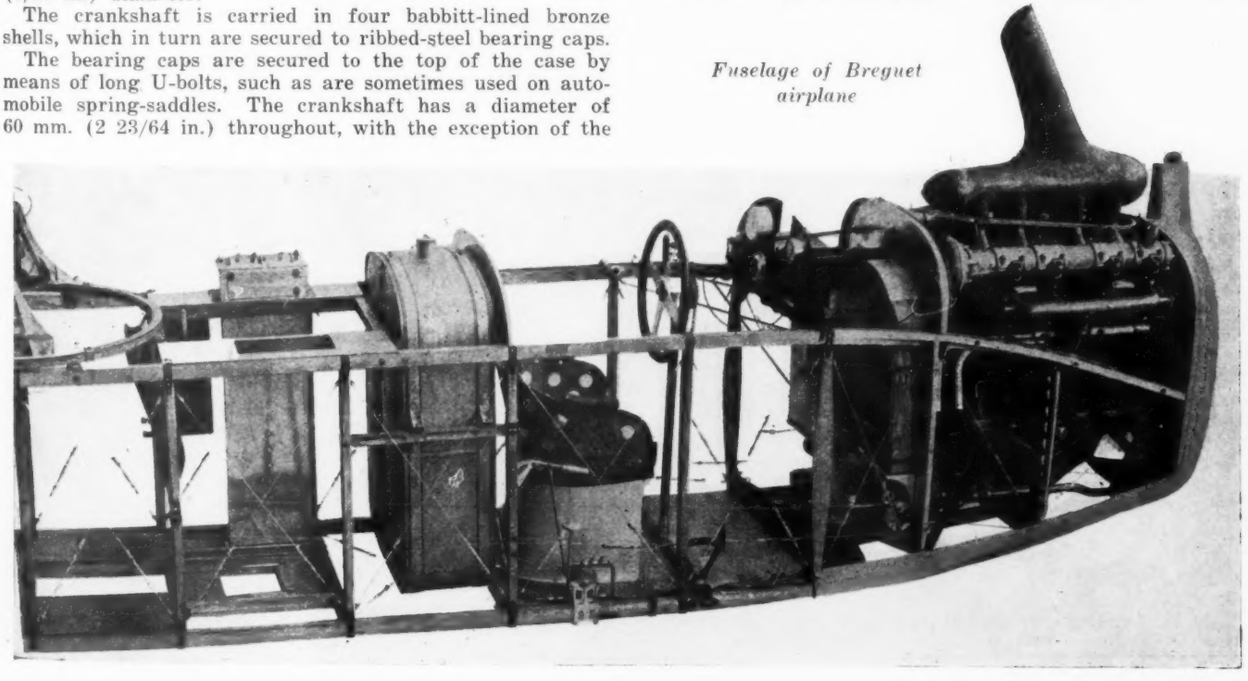


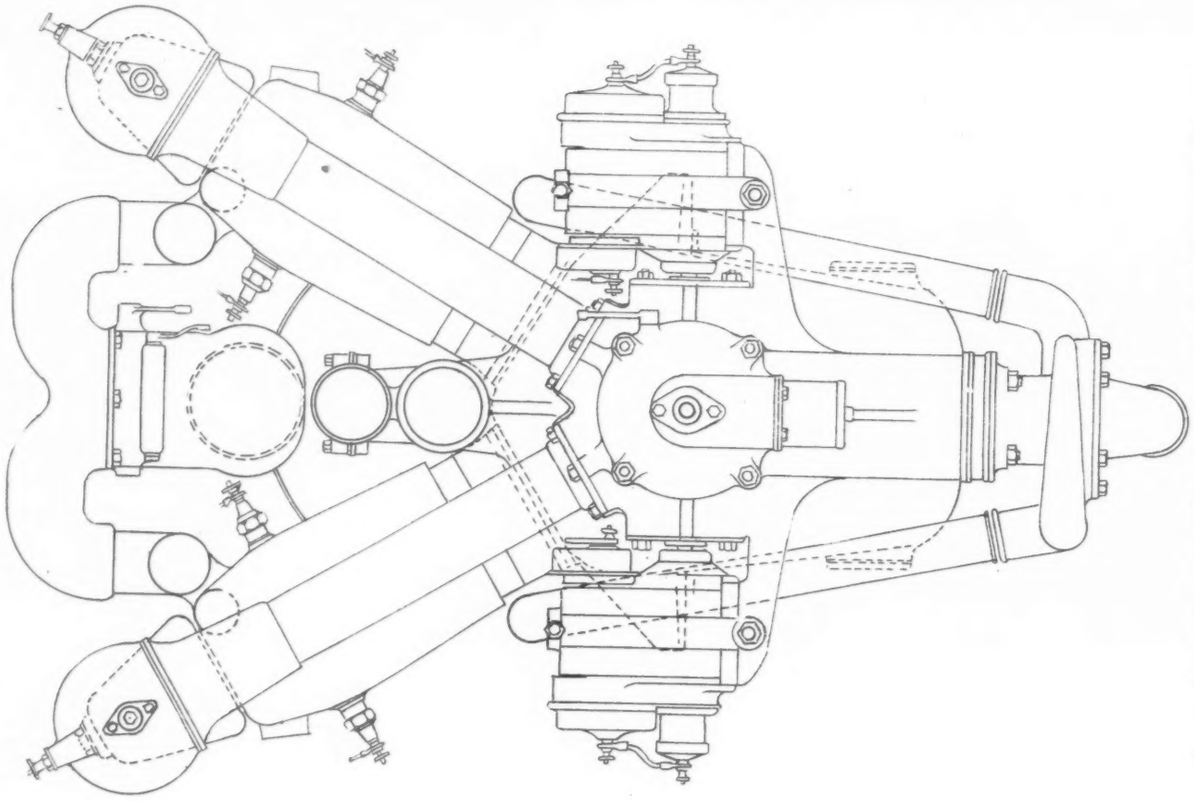
300-hp. Renault engine

The shaft is drilled out for lightness, but oil is carried from the main bearings by means of thrower rings and separate small steel pipes to the connecting-rod big-end bearings. The front end of the crankshaft is splined to receive the starting gear and accessory drive. The bottom half of the crankcase serves as an oil-pan and has a screen dividing it into two compartments. The water-pump is mounted at the front of the engine on the bottom half of the crank chamber, and has an especially designed double runner and double collector. The water is piped to both sides of the engine, through copper pipes, and rubber connections are interposed to prevent cracking of joints due to vibration.

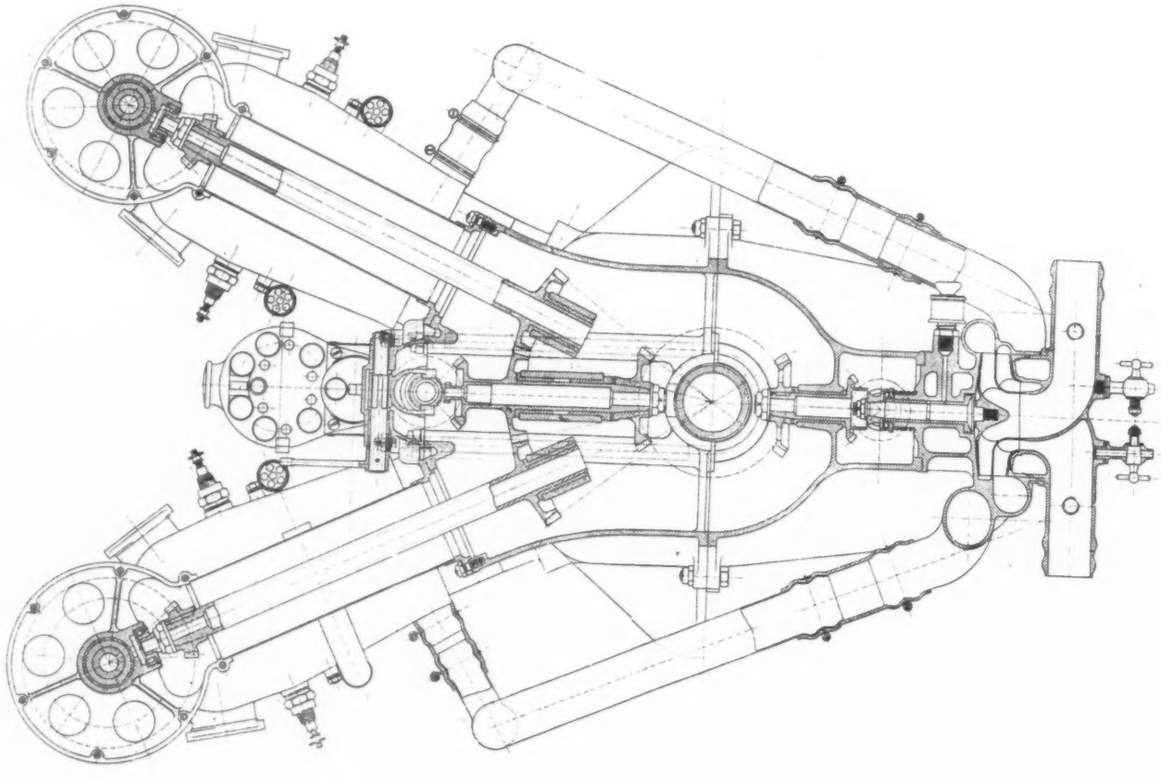
The carbureter is of the single float type. Two carbureters are mounted on each side of the engine and bolted to the crankcase by means of long studs. The intake pipes, which are fastened to the carbureter by means of unions, are made of copper tubing 48 mm. (1 57/64 in.) in diameter.

Fuselage of Breguet airplane

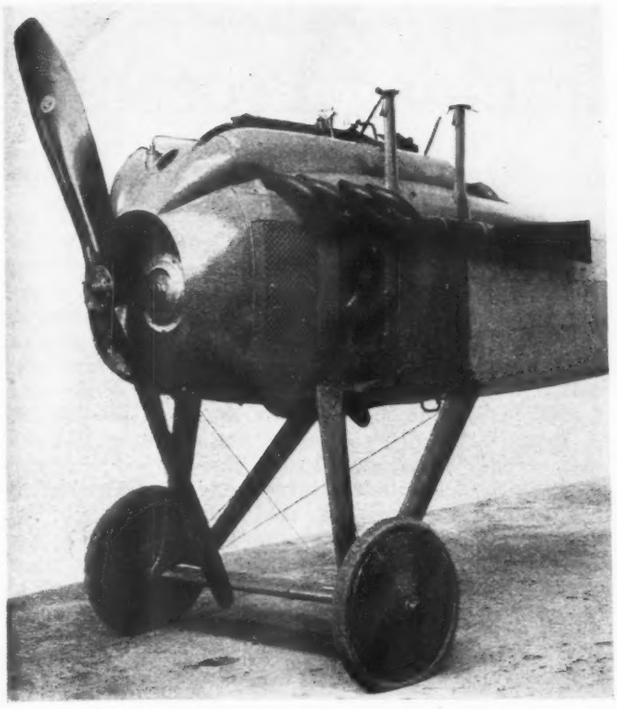




Front view of Renault 400-hp. aviation engine, showing magneto and pump drive



Front view of Renault 300-hp. aviation engine, showing high-speed camshaft drive



Forward part of fuselage of Breguet plane

The carbureter has a pair of primary nozzles, a pair of secondary nozzles and an auxiliary air valve, the latter consisting of an annular ring mounted concentrically with a venturi throat.

The oiling system is extremely simple. Oil is carried through cast ducts in the front and rear compartments of the crank chamber to the main bearings. It is also carried from these ducts through two copper tubes up to the overhead camshaft case, passes through the camshaft case and returns down through the distributing gear case to the oil sump.

The valve gear is contained in a light steel tube, carried on the studs from the cylinder head, which is slotted to take bronze cages that form both the camshaft bearings and the rocker-arm mountings. The rocker arms are arranged to multiply the cam motion so that the valve opens 12 mm. (15/32 in.). The camshafts and the driving shaft are driven through straight bevel gears of 12½ mm. (½ in.) face. The inclined shafts which drive the camshafts operate at three times camshaft speed. The high speed of these shafts and the resultant lowering in torque on them allows their weight to be considerably decreased. This arrangement is cheaper and much lighter than that where a train of spur gears is used for driving magnetos and camshafts. Many other aviation engines use bevel gears for driving the camshaft, but few designers seem to have grasped the importance of operating the auxiliary shaft at high speed.

There are four magnetos mounted co-axially, each pair being driven through a spur gear, which in turn meshes with a spur gear which is slidably mounted on a splined magneto drive-shaft. The magneto drive-shaft terminates at its forward end in the sleeve of a bevel gear, and is provided with helical splines, so that when the shaft is moved longitudinally it is also moved angularly. This method of advancing the spark obviates the need for many connections to magneto breaker boxes, and also insures a spark of the same intensity, regardless of whether the ignition is advanced or retarded.

At the front end of the crankshaft is mounted an aluminum six-cylinder air-starting motor, which engages the crankshaft by an overrunning clutch. This air-starting motor has a single inlet and discharge valve for six cylinders, of the rotating disk type. A hand starting gear and the starting magneto drive are also built integral with this starter.

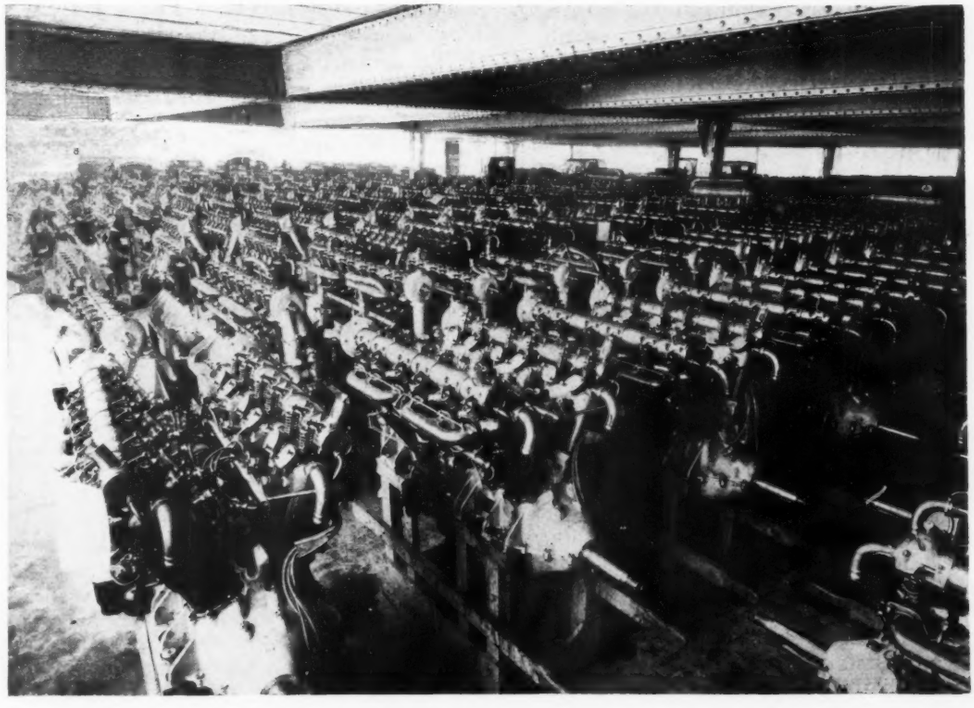
Higher Line Shaft Speeds Advocated

"SPEED up your line and counter shafting and decrease the size of shafting, size of pulleys and width of belts," is the suggestion for decreasing the demand for steel for transmission purposes, made by Melville W. Mix, president of the Dodge Mfg. Co., speaking before a joint session of the National Supply and Machinery Dealers' Association and the Southern Supply and Machinery Dealers' Association.

"Increasing the speed will allow the use of smaller shafting, smaller pulleys and narrower belts. Shafting is one of the scarcest commodities, yet one of the most essential.

"New installations are being made along standardized lines. I want to urge standardization in this line. Specially made appliances are being supplied only after much delay. This is a big day for standardized parts on account of their ability to be changed to peace time uses."

THERE seems to be a scarcity of mica in Great Britain, for a so-called mica control order has just been issued by the Minister of Munitions, according to which it is necessary to obtain a special permit in order to purchase mica. Mica must be used only for such purposes as are specified in the license. All applicants for licenses must make a return with regard to their stock, purchases, sales and deliveries of mica.



To judge from this view in the Renault stockroom, France is not short of aircraft engines

The Greenstreet Cracking Process

Converts Kerosene Distillate Into Gasoline—Two Experimental Plants in East St. Louis—Patent Holding Company Will Issue Licenses

At the present time much of our commercial motor fuel is the product of a so called cracking process whereby the hydrocarbons of the heavier grades are converted into lighter grades. The application of such processes has resulted in a much greater yield of tolerably volatile motor fuel from crude petroleum and has undoubtedly been the most important factor in keeping the supply of motor fuel up and the price down.

Several different cracking processes have been developed, all based upon the principle of applying heat and pressure to the heavy hydrocarbon and in this way producing a molecular transformation. Our attention has recently been called to the Greenstreet process, the patents on which are owned by the Gasoline Corporation of New York City, a Delaware corporation with a capitalization of $3,000,000. The company owns three refineries, all located near St. Louis. These are really demonstrating plants, as the concern has no intention of entering the oil business commercially on a large scale but plans, rather, to act as a licensing company.

An apparently very thorough investigation of the Greenstreet process as it is worked at the East St. Louis plant of the company has been made by Dr. Edward C. Worden, an analytical and consulting chemist, and AUTOMOTIVE INDUSTRIES has been furnished a copy of a 46-page report thereon made by him.

By the Greenstreet process a liquid fuel suitable for ordinary internal combustion engines is made from petroleum distillate which if subjected to the ordinary purifying process would be commercial kerosene. This distillate is used as a basic material, rather than crude oil as pumped from the ground, because this crude oil contains natural gasoline and it is more profitable to first distill off this gasoline. As Dr. Worden expresses it, the crude oil costs more than the distillate fraction of it which is converted by the process.

In trial runs made in Plant No. 2 at East St. Louis during Dr. Worden's investigation, a yield of a little over 60 per cent gasoline was obtained from distillate. In these runs the distillate was subjected to two crackings, which is believed to be the commercial limit. If the cracking was repeated a greater number of times a greater percentage yield could be realized but probably no commercial gain.

Toronto Tests

In tests made at the Toronto plant of the British-American Oil Company (operated under license from the Canadian Gasoline Corporation, Ltd.) something over 100,000 Imperial gallons of distillates were cracked in 17 days. Owing to shipping conditions, which made it expedient to treat the distillate about as fast as it arrived at the plant, the process was limited to two crackings, and the average yield was 52.2 per cent.

Following is a brief description of a six tube Greenstreet furnace, taken from the Worden report. The furnace consists of a pre-heater of a certain length, into which the oil and steam are introduced together on the side, at the point where the pre-heater tubes enter the furnace proper. The oil is not heated before it meets the steam, preliminary to the entrance of both into the pre-heater tubes. Only little steam is admitted at this point, because the oil must not be cracked in the pre-heater, for if it should be cracked there, then it would be cracked again in the individual cracking tubes, which would result in the formation of free carbon on the one hand, and a large volume of fixed gas on the other. The temperature of the oil and steam in the pre-heater should be as near as possible to the point of gasification of the oil, this resulting in a maximum output from the tube in a given time, and a maximum yield from a certain amount of distillate. The best temperature in the pre-heating tube is always in the neighborhood of 480 degrees F. The distillate operated upon, as it enters the cracking tube, is approximately of a gravity of 41.7 degrees Baumé.

Time Varies

Another variable in the process is the time in which the pre-heated oil and the super-heated steam remain in the coil. This time may be increased, or the reaction due to it may be accelerated by either increasing the length of the individual coil, or the number of the lengths of coil, or by increasing the heat to which the oil and steam are subjected during their passage through the coil. The condition of cracking inside the tube may be gaged by the appearance of the fumes issuing from an indicator pipe and the color of the condensed distillate which drops therefrom. When the fumes are whitish in color, and the condensed distillate is of a cherry red tinge, then the cracking has reached that desirable stage when the maximum of change to the gasoline or paraffin series of hydrocarbon results, but has not gone beyond that stage into the aromatic series of hydrocarbons, with a consequent production of carbon and a large volume of fixed gas. If the temperature is too high, or the ratio of steam to oil too great, or if the cracking tubes are not long enough, then brown fumes will be emitted from the indicator pipe, showing that the oil has been too vigorously acted upon, and has gone beyond the paraffin gasoline series of hydrocarbons into the closed chain aromatic hydrocarbons, and hence the yield of gas is not a maximum. One pound of coal is said to be consumed per gallon of finished gasoline produced. Each cracking tube consists of approximately 200 ft. of condenser coil, represented by 10 lengths of 20 ft. pipe, 2 in. internal diameter, and one superposed above the other at about 6 in. centers.

Cold petroleum distillate is introduced with the steam in the proportion of about one part of water to five parts of oil, the pressure under which the steam is introduced being 35 to 100 lb. per square inch for paraffin, or crude distillate abounding in paraffin hydrocarbons, and about 125 lb. per square inch for a distillate in which an asphaltic base predominates. The time it takes for the oil and steam to pass through the cracking tubes and collect as a gaseous product in the expansion tank is less than one minute, about 2 gallons

of oil being passed through under favorable conditions per minute. At the time of Mr. Worden's visit to the plant only about 9 gallons was passed through each six cracking tube furnace per minute, instead of 12, owing to the severe cold.

The gaseous product obtained in the cracking is led from each individual cracking tube into an individual expansion chamber of about 100 gallons capacity, upon which there are individual pressure gages, by means of which the pressure is maintained at as nearly 80 lb. per square inch as possible. From an outlet in the expansion chamber about one foot from the bottom, the gaseous products pass downward into a condensing coil system, and then out into storage tanks, the product at this stage being known as synthetic crude oil, which, so far as the cracking process is concerned, is finished.

From this point onward, the gasoline hydrocarbon formed is merely separated by distillation from the unchanged or but partly changed crude distillate, and that portion which remains behind, and, therefore, has not been cracked, is returned to the cracking tubes, usually with an equal volume of crude distillate. Coming back to the synthetic crude product, which is light brown in color, and which will readily ignite when a match is placed in proximity to it, in contrast to the oil which has not been passed through the cracking tubes, this synthetic crude is placed in quantities of about 300 barrels, at a charge into a fire still, with perforated steam coils inserted therein. The perforations of the coil face downward. By means of fire underneath, distillation is commenced and continued until a boiling point of about 410 degrees F. has been reached. This process, therefore, divides the crude distillates into two parts, i.e., that which has been driven over at the temperature and gravity stated, and, secondly, that which, having refused to pass over under these conditions, remained in the fire still.

This is really commercial gasoline, which, however, is not salable because it has a brown color, and contains some water from the condensation of the steam from the steam coil inside the fire still. This brown liquid (crude benzine) is pumped into a vertical lead-lined agitator, in which it is agitated by means of compressed air, and there is then added to it, a small proportion at a time, 2 pounds of sulphuric acid of 66 degrees Baumé, to each 42 gallon barrel of benzine. Air is blown in, and the mass is agitated in this way for a period of 10 to 15 minutes, after which the contents are allowed to stand about 1 hour. The longer the mixture is allowed to stand, the better it is, in that the final product becomes lighter in color. While the material is standing, the acid, being by far heavier than the oil, is drawn from the bottom of the agitator and is discarded.

The oil, after the acid has been drawn off, is washed for 3 hours by allowing a stream of cold water to flow over it from the top, and the water, being of greater gravity than the oil, flows through the oil, and collects at the bottom, from which it is withdrawn. This washing process is continuous, but there is no agitation of the oil.

The Widney Patent Resiliometer

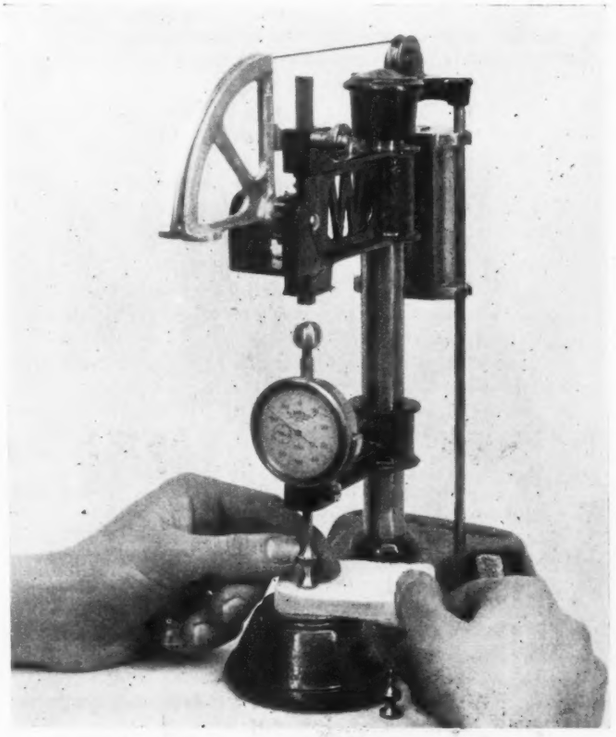
A NEW design of resiliometer for testing felt, rubberized fabrics, paper, etc., has been developed by Stanley W. Widney of the Advance Felt Specialty Co., Chicago. The instrument is designed for use in measuring the thickness, hardness and resiliency of any resilient material.

There are four essential elements in the construction of the device, viz., an anvil on which the material being tested is placed; a direct reading micrometer, reading to the thousandth part of an inch; a quadrant moving on a pinion, which carries the support of a 2.6-lb. weight, and the presser foot, which comes in contact with the material and registers directly on the dial.

In the use of the instrument, a piece of resilient material is inserted between the anvil and the presser foot. As soon as the presser foot rests securely upon the material, the hand of the dial shows the thickness in thousandths of an inch. When this reading has been obtained, the weight at the right is released, and is allowed to apply pressure without shock upon the material. This causes the presser foot to sink into the material until the pressure is counterbalanced by the natural resistance or hardness of the material. As an example, we will suppose that the original thickness registered on the micrometer dial is 0.100 inch, and that under the pressure of the weight the material compresses until it is only 0.050 inch thick. Then the resistance of the material to pressure, or its hardness, is given as 50 per cent. If the original reading had been 72 and the reading under pressure 54, then the hardness of the material would have been 75 per cent.

Suppose that after the reading under pressure was taken, the weight was lifted off by moving the quadrant, then the natural resiliency of the material would at once have asserted itself, causing the micrometer needle to jump back. The recovery of the material in thousandths of an inch would be noted and from this the percentage of resiliency determined. Suppose, for instance, that the material which registered 0.050 inch under pressure recovered instantly to 0.080 inch after the weight was removed; the recovery then would amount to 0.030, which is 3/5 of 0.050 in., the thickness under pressure, which would give a resiliency of 60 per cent.

It is believed that a wide use will be found for this instrument in dealing with materials such as felt, rubber, leather, paper, asbestos, packings of all kinds, cords, fabrikoids, etc.



The Widney Resiliometer will measure the thickness of material to the thousandth part of an inch

Moline Universal Model D Tractor

Four-Cylinder Valve-in-Head Engine Substituted for Two-Cylinder Opposed—Electric Starting, Lighting and Engine Governing System Fitted—Two-Wheel Principle Retained

By P. M. Heldt

EVEN at this early date there is a good deal of "sameness" in motor tractor design. Most tractors are of the four-wheel drive, and making an exception of the final drive the general arrangement of parts is very much alike on all of them. But the Moline Universal tractor is a type apart bristling with points of originality. The Universal tractor has been on the market now for nearly two years. Its most characteristic feature is that it has only two wheels and that the operator sits on the implement which is being pulled, from which he controls the tractor.

A two-wheeled tractor possesses one important inherent advantage over a tractor in which the weight is distributed over a greater number of wheels. In connection with tractor design the statement is often made that there is no object in trying to save weight, as you need weight to secure traction. Well, only the weight supported by the drivers counts, and if 98 per cent of the weight of the tractor can be made available for traction, instead of the usual percentage of about 70, then the weight of the tractor can rationally be reduced by such expedients as the use of alloy steel in all shafting without fear of lack of traction under different conditions. A saving in tractor weight means a saving in power and, consequently, a gain in fuel efficiency.

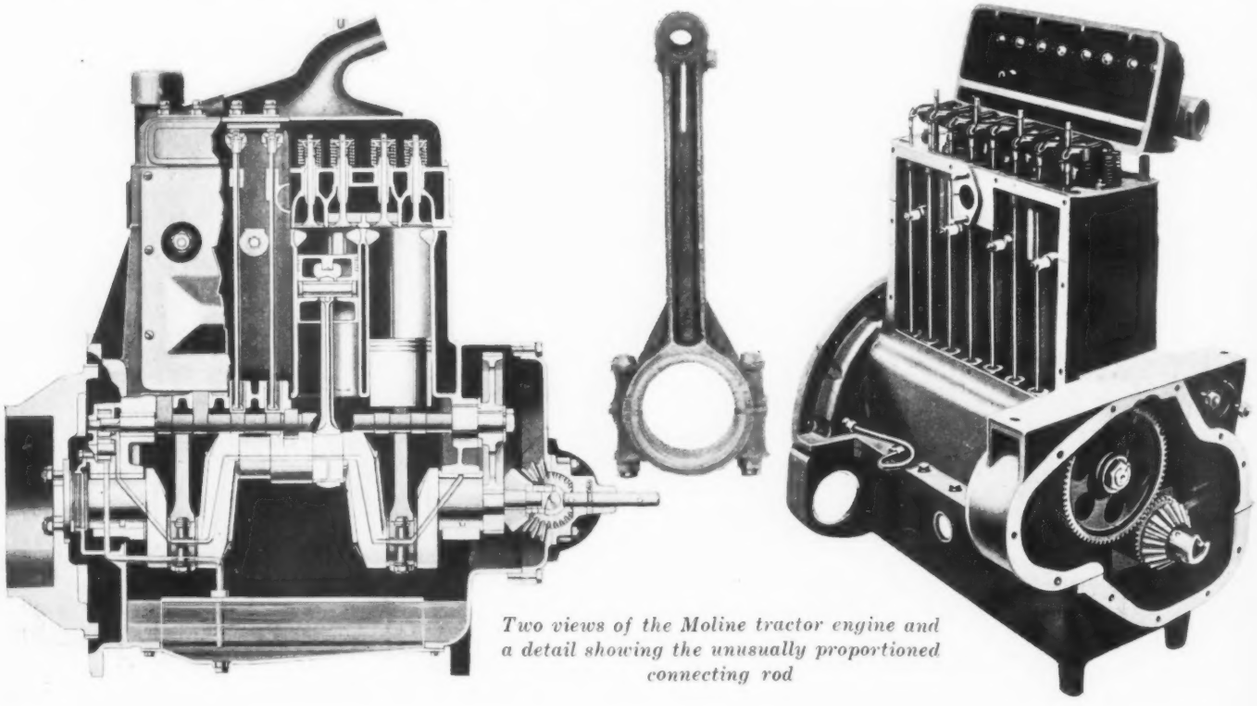
The engine of the Model D is of the company's own design and manufacture. It is of the four-cylinder type with valve-in-head cylinders, of 3.5-in. bore and 5-in. stroke. There are only two main bearings on the crankshaft, which is of unusually large dimensions. The cylinders are cast in a block, together with the upper half of the crankcase, while the cylinder heads form a separate casting.

The crankshaft is of exceptionally rugged construction, all bearings being 2½ in. in diameter. The object in using the two bearing type of crankshaft is to make the engine as compact as possible lengthwise. It is claimed that, owing to the large size of the bearings, there is very seldom need for adjustment of same, and when adjustment is required it can be easily made. The combined length of the two main bearings is 5⅞ in.

Pistons are of cast iron, with the usual ribs between the piston bosses and the piston head. The connecting rods are I-section drop forgings, and are of unusual appearance, owing to the large size of the heads. The upper end of the rod is clamped tight to the wrist pin, which latter has its bearings in the piston bosses. The crankpin bearings are bronze backed nickel babbitt bearings, and they can be taken up by merely removing the bottom plate of the crankcase. The connecting-rod caps are held in place by means of alloy steel bolts with castellated nuts. The piston pins are also made of alloy steel and are ground to size. They bear directly on the cast iron of the piston bosses. For this feature the advantage is claimed that more efficient lubrication can be obtained than if there were a bearing in the connecting-rod end, besides which the bearing surface is about 50 per cent larger. The pistons are light in weight, and are all equalized so as to reduce vibration to a minimum.

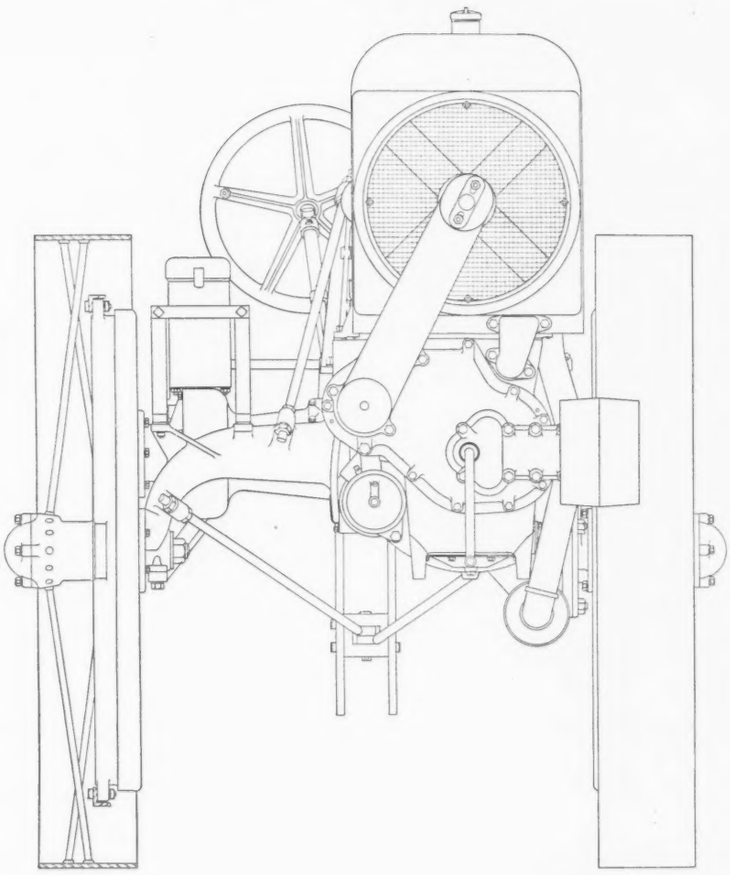
A one piece drop forged steel camshaft, 1½ in. in diameter is used. All of the cams are forged integral with the shaft, are hardened and ground to shape, and the shaft is supported in three bearings. The camshaft gears are of wide face, and are cut with helical teeth to insure quiet operation.

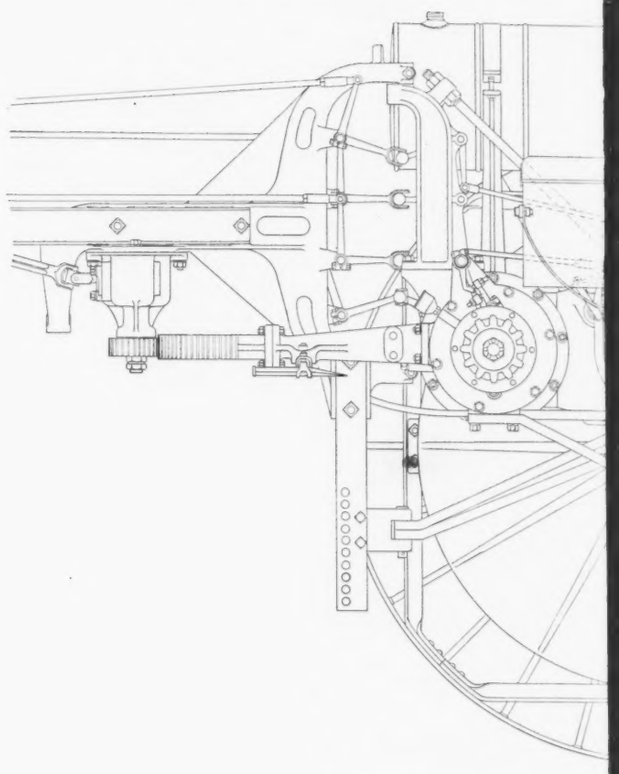
Considerable attention has been paid to the design of the valve gear. The valves themselves are made of a chrome-



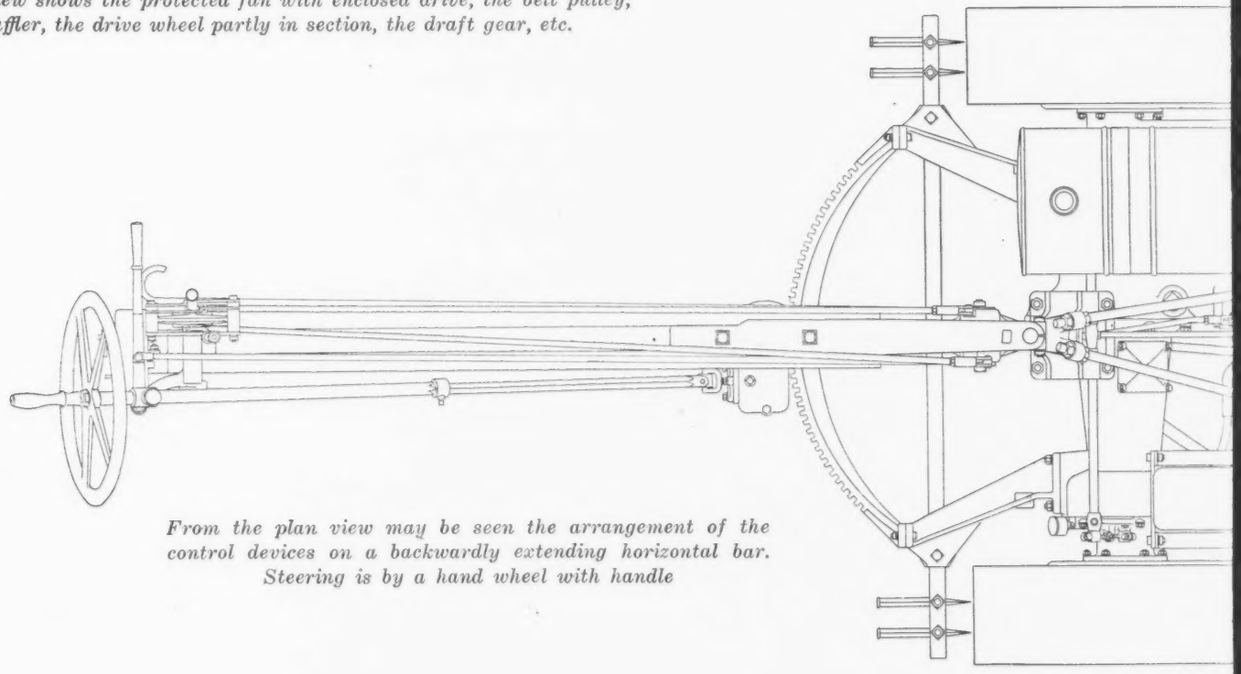
Two views of the Moline tractor engine and a detail showing the unusually proportioned connecting rod

Moline Model D Two-Wheel Tractor—
Side Elevations and Plan



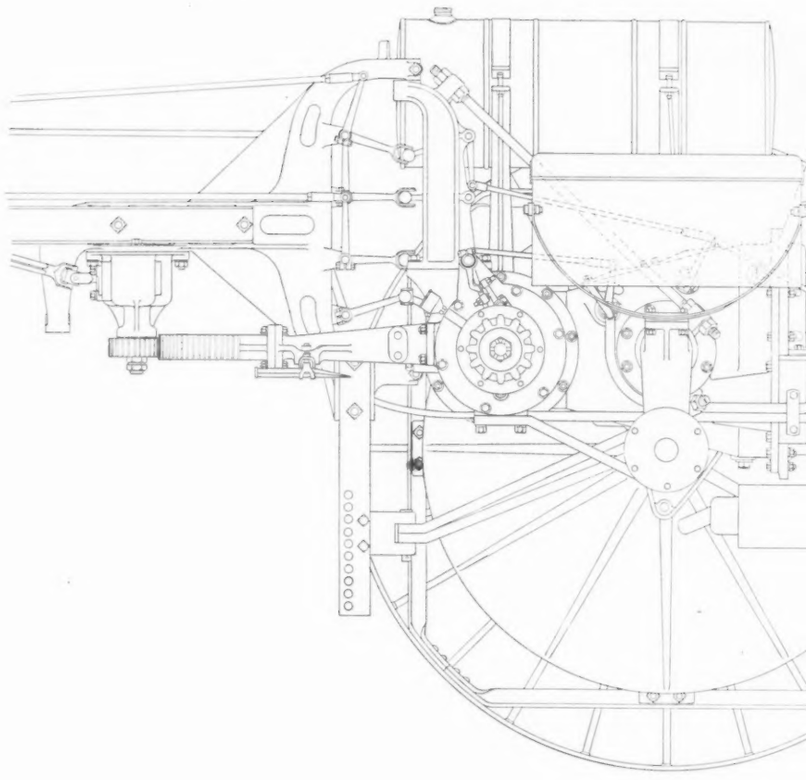


The front view shows the protected fan with enclosed drive, the belt pulley, the muffler, the drive wheel partly in section, the draft gear, etc.



From the plan view may be seen the arrangement of the control devices on a backwardly extending horizontal bar. Steering is by a hand wheel with handle

Moline Model D Two-Wheel Tractor—Front and Side Elevations and Plan



e belt pulley,
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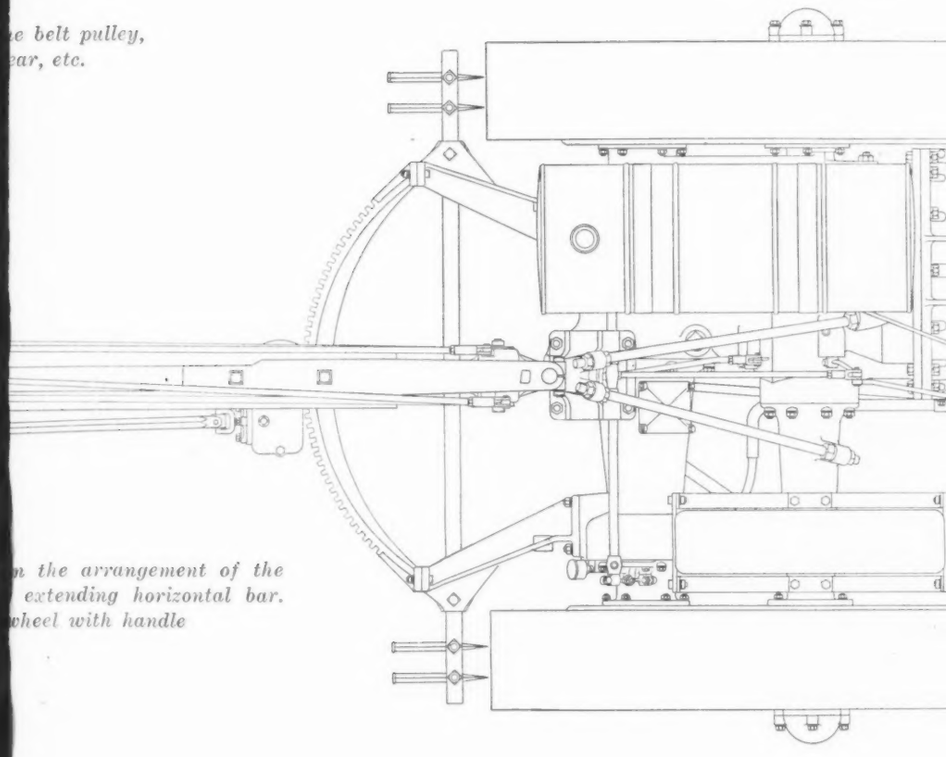

n the arrangement of the
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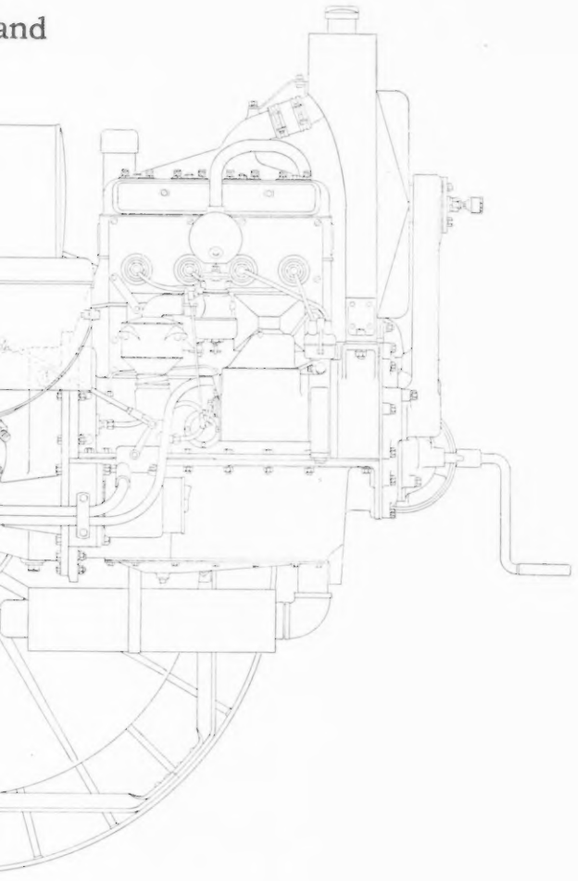
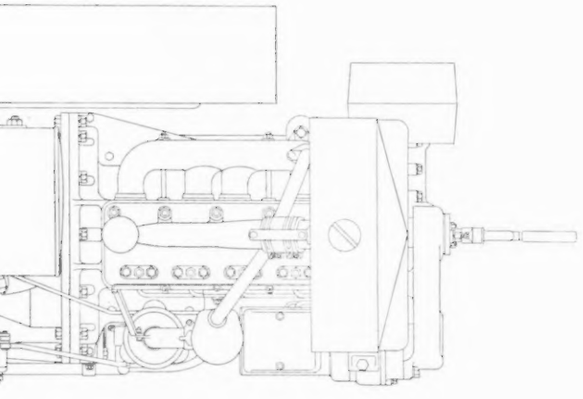


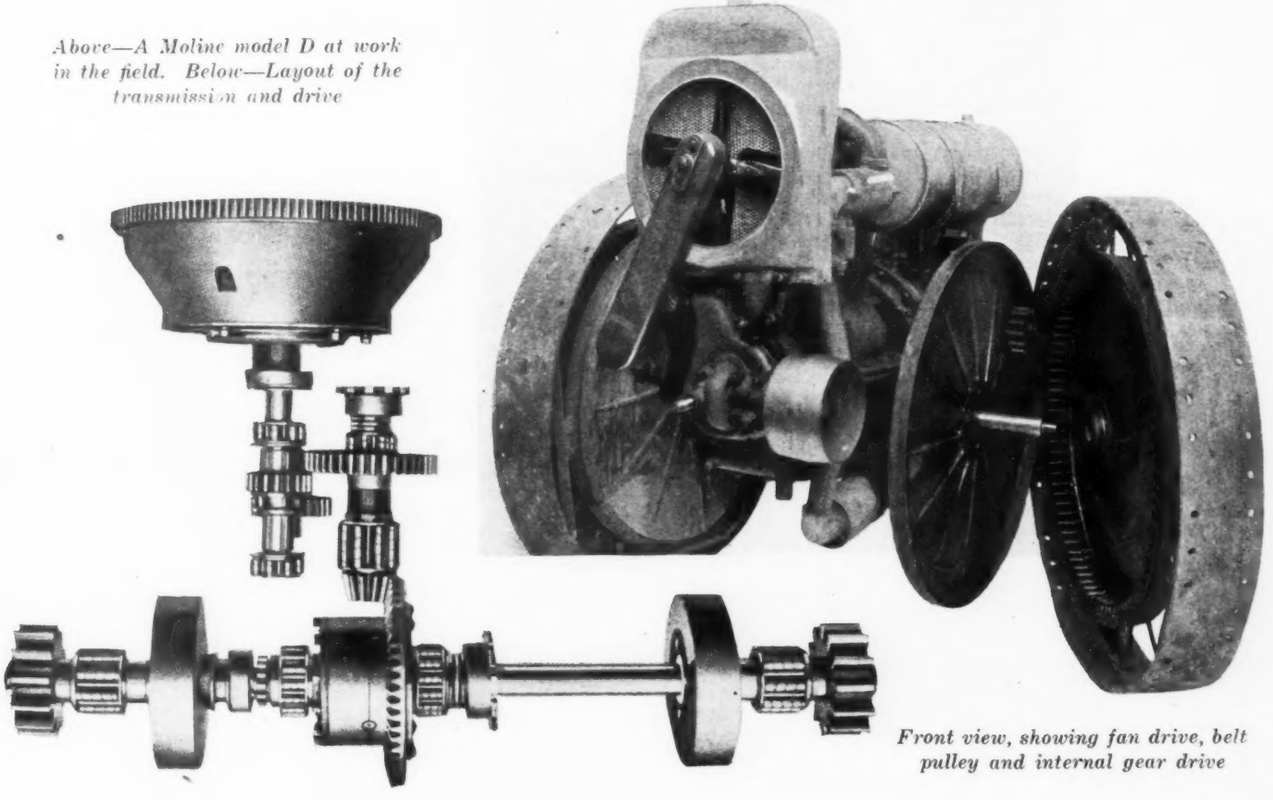


nickel alloy steel, and are surrounded by two coiled springs each. The use of double springs is a safety measure, as the breakage of a single spring will not prevent the engine from operating. It is also claimed that this arrangement of springs makes it possible to open and close the valves quickly, and still insure smooth seating of the valves. The Brush type of tappet lever is used, which has a self lubricating spherical pivot support adjustable from outside the valve housing. This tappet lever has arms of unequal length and multiplies the cam motion by two. The ball and socket joint of the rocker arm is both hardened and ground, and so arranged that the joint is full of oil at all times, thus insuring long life of the bearings. The valves have a clear diameter of 1¾ in., which is equal to one-half the cylinder bore.

Gasoline is the fuel used on Moline Universal tractors. The fuel supply is carried in a 15 gal. tank, cylindrical in form, which is located in a high position directly behind the engine. A Holley carbureter is used, which draws air through a new type Bennett air cleaner, to insure that all dust and grit are removed from the air before it enters the cylinders.

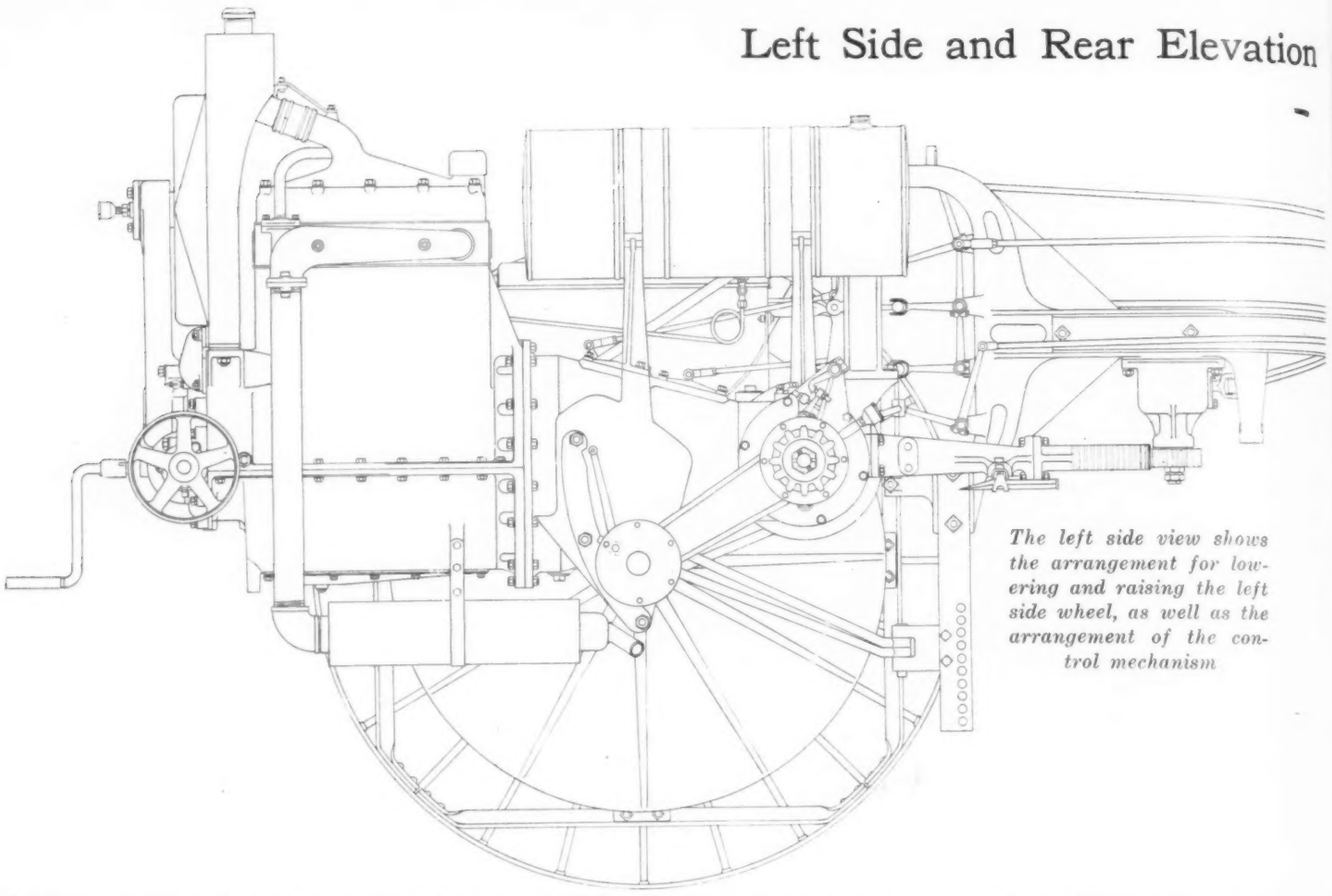
Ignition is by the Remy battery system, which forms a part of the electrical equipment, all of which is of Remy make. The generator of this system, in addition to generating electric energy for charging a storage battery and operating the electric starter and lights, also serves as an engine governor. A full description of this electric system appeared in the May 2 issue of AUTOMOTIVE INDUSTRIES, and it is not necessary to go into details here. Suffice it to say that a Willard battery is used in connection with the system. The governor-generator is driven from the helical cam shaft gearing. It is claimed for this governor that it does not flutter or hunt, but works perfectly, governing the speed of the engine under varying loads on the belt and in the field. One point in respect to which the governor differs from the conventional flyball governor is that there is no one particular speed to which the engine is held, as by means of a control box underneath the steering wheel the speed of governing can be varied within wide limits. The battery is carried in a stamped steel, waterproof case, which is spring suspended to relieve it from sudden jars and shocks. As regards the

Above—A Moline model D at work in the field. Below—Layout of the transmission and drive



Front view, showing fan drive, belt pulley and internal gear drive

Left Side and Rear Elevation



The left side view shows the arrangement for lowering and raising the left side wheel, as well as the arrangement of the control mechanism

lighting equipment, the tractor is provided with a movable headlight, which can be set in any position, and also with the lights on the control box in the rear, which illuminates the plow. All wires are carried in armored conduits, and the entire system is waterproof. The control box underneath the steering wheel contains a switch for controlling the ignition and the lights. By pushing the clutch lever forward, the starting motor is thrown into operation by means of a Bendix drive. Thermo-siphon circulation of the cooling water is employed. The water passages in the engine jackets and the radiator are of unusually large size. This system of cooling is said to have proven satisfactory under the most trying conditions. It will be observed from the part-sectional view of the engine that the water-jacket extends all the way down the cylinders, and that there are also large water spaces in the cylinder heads. The cooling water is circulated through a large Modine-Spirex radiator, in front of which there is a four-bladed fan mounted on Hyatt roller bearings. This fan is surrounded by a housing which increases its cooling efficiency and protects it against mechanical injury. It is driven by an inclosed endless woven belt, the tension of which may be readily adjusted. The whole of the cooling system has a capacity of 3 gal. The radiator is mounted on the forward part of the tractor, in a high position, where it is out of the dust, and it is protected from weeds and leaves by a heavy wire screen.

A full force oiling system is used, oil being forced under pressure to all crankshaft bearings. The oil pump is driven from the rear end of the camshaft, and forces oil under 35 lb. per square inch pressure into the rear crankshaft bearing. The crankshaft is drilled out, as indicated in the sectional view of the engine, and through it oil is carried to the several crankpin bearings and to the forward main crankshaft bearing. A separate lead from the oil pump carries oil under pressure to the camshaft bearings. The pressure employed is higher than usual in force-feed systems, and it is claimed that all crankshaft, connecting-rod and camshaft bearings float on a film of oil, so that it is impossible for the babbitt and steel to touch. The oil thrown off by the rapidly rotating crankshaft forms an oil mist, which lubricates all interior parts of the engine, the belt pulley drive gears, the camshaft gears and the entire valve mechanism. All excess oil returns to the base chamber, where it is strained through a large gauze strainer and given a chance to cool before it is re-circulated.

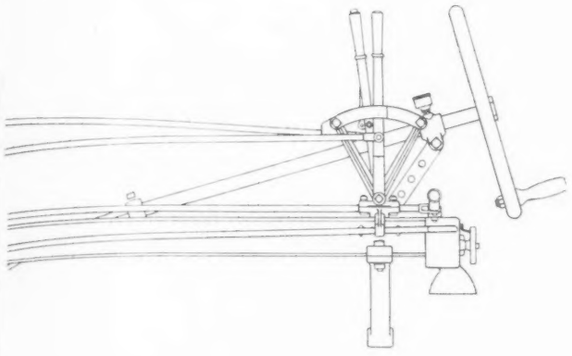
Belt power is taken off a pulley located in an accessible position in the front of the engine. It is 9 in. in diameter and has a face width of 6½ in. with ample crown. The shaft of the belt pulley, which is mounted on Hyatt bearings, is driven through hardened steel gears. This gearing is of the bevel type, and is so proportioned as to give a belt speed of 2500 to 3000 ft. per minute, which is in accordance with the usual practice. It is claimed that the engine develops 18 hp. on the belt, and will handle any farm machinery up to a 24-in. grain separator.

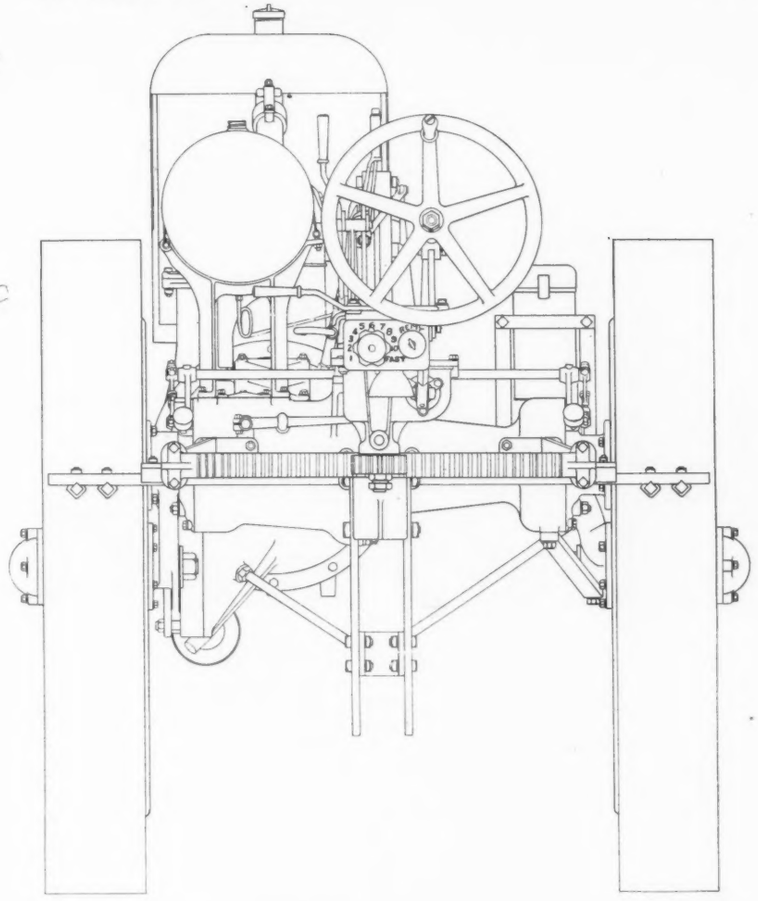
A Borg & Beck dry-plate clutch is located in the flywheel. This clutch is well known to our readers, and need not be described here. The transmission is inclosed in a rigid, one-piece cast-iron housing, which holds all bearings in perfect alignment. All of the shafts in the transmission and final drive are splined. In fact, there are seven splined joints in the transmission, and one pinion is formed integral with the shaft.

A plan view of the transmission layout is shown herewith. There is a sliding pinion on an extension of the clutch shaft. This is adapted to engage either with a gear on the secondary shaft or with an intermediate pinion for obtaining the reverse motion. On the secondary shaft is carried a bevel pinion, which meshes with a bevel crown gear on the differential. It is the bevel pinion which is formed integral with its shaft. Ball thrust bearings are provided on both the secondary shaft of the transmission and on the differential shaft to take up the thrust due to the bevel gear set.

The differential is of the bevel pinion type, containing four bevel pinions. Its master gears are splined to the differential shafts, and to the outer ends of these shafts are splined

# of Moline Model D Tractor





the bull pinions. This method of securing the bull pinions to their shafts makes it easy to remove them. Anti-friction bearings are used throughout the transmission and drive, there being 15 Hyatt roller bearings and eight ball bearings on the tractor. The entire drive from the engine to the ground is carried on Hyatt high duty roller bearings, which are protected from dust and dirt, and run in an oil bath to insure their lubrication. A feature of considerable importance is a differential lock by means of which one of the differential shafts is secured rigidly to the differential housing. The operation of the lock is performed from the seat. The possibility of rendering the differential gear inoperative is of considerable value when the tractor has to work on slippery ground. The final drive is by bull pinions and internal gears, the latter being secured to the driving wheels, as is plainly shown in one of the end elevations herewith.

All the main connecting parts of the tractor and engine which go to make up the general frame work are held together by bolts, which clamp two faces together, one of which has a heavy circular flange. This flange fits closely into a machined shoulder, taking away any tendency to shear off the bolts. The engine is fitted to the transmission in this manner, and the right-hand axle arm, the right-hand differential shaft arm, and the right and left-hand bull pinions bearing containers are secured in the same way.

Inspection Plates Provided

Inspection plates are provided on the transmission, clutch and other housings, and enable the operator to get at all important parts readily. On the differential shaft, between the differential shaft and the bull pinions, there are two brake drums, on which act internal expanding brakes, which are controlled from the seat. These brakes serve not only for stopping and holding the tractor, but they also perform a function in connection with the steering. By pushing forward on the brake lever, the right-hand brake is engaged, which permits the tractor to be turned easily toward the right; by pulling back on the lever, the left-hand brake is engaged, which permits the tractor to be turned easily to the left. There is, of course, a special steering gear for steering the tractor, but by means of the brakes the effort required to steer in loose ground can be considerably reduced, which is of importance when the tractor is being operated by a boy or woman.

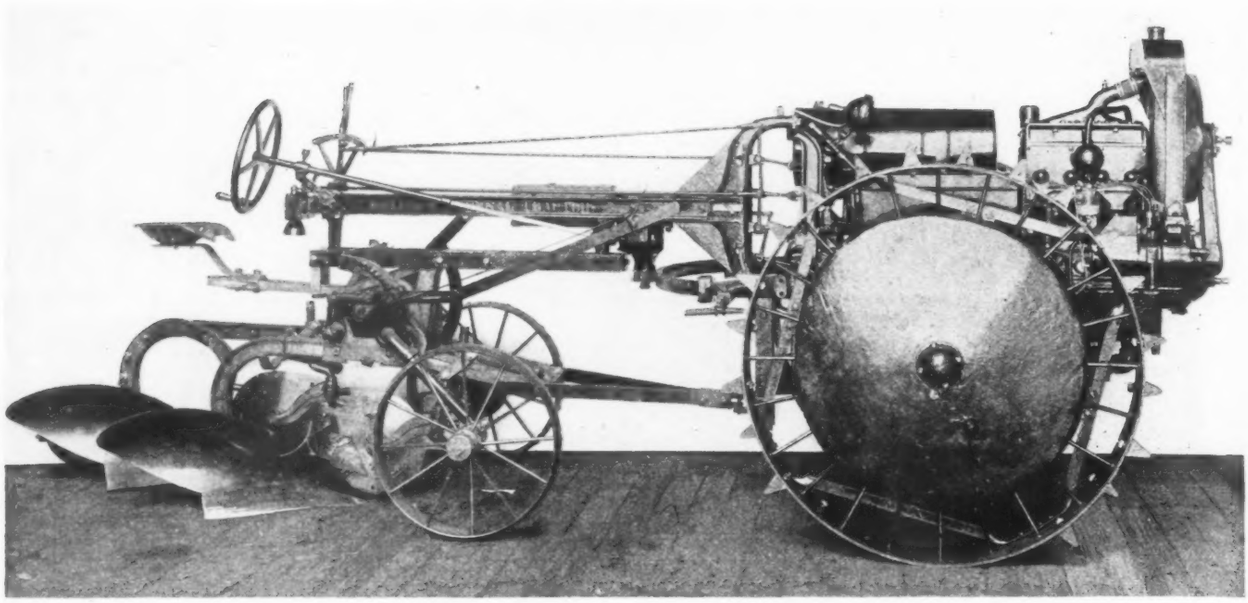
The bull gears are cast of semi-steel; they are of the internal type and are completely inclosed. Heavy gear grease is introduced through a hole in each inclosing shield, which has a sliding cover. This grease lengthens the life of the bull gears, and forms a seal at the edge of the shield to keep out the dust. The bull pinions are also mounted on Hyatt roller bearings.

While the Moline tractor is designed as a two-plow machine, it is capable of operating at considerably higher speed than the average tractor, and is claimed to be capable of accomplishing as much in a day as the average three-plow tractor. It is said that by the use of the right kind of moldboard, better plowing can be done at 3 to 3½ miles per hour than is possible with the slower plow. Of course, two plows require less draft than three plows, and the whole tractor can be made so much lighter, while the bearing and gear pressures are also proportionally reduced. The model D Universal being a light machine, it can be used also for cultivating and other two or three horse work. Strong claims are made for the advantage of plowing at higher speed. Thus it is said that tough, leathery sod can be turned at 3½ miles an hour which will defy all efforts to turn it with the same plow and tractor at 2½ miles per hour. Stubble ground is said to be broken up and pulverized much better, leaving less air space, which makes a better seed bed and requires little disking and harrowing. With the right kind of moldboard the soil is not thrown at 3½ miles per hour, but turned just in the correct way. Two plows driven at 3½ miles per hour correspond to plowing 10 acres in 10 hours, which is about the same amount of work as can be performed with three plows at 2½ miles per hour.

Has 56-In. Tread

The Moline Model D has a tread of 56 in., measured to the outside of the wheels, which latter are 52 in. in diameter and have an 8-in. face. Of the total weight of 3380 lb. of the tractor, 98 per cent rests on the two driving wheels, while the remaining 2 per cent is carried by the implement which is being pulled by the tractor. The left tractor wheel, which runs on the unplowed land, is so arranged that it can be raised or lowered at will, with the object of making the tractor stand up straight, although one wheel runs in the furrow. This makes the tire rest flat on the ground and gives better traction with less wheel slippage.

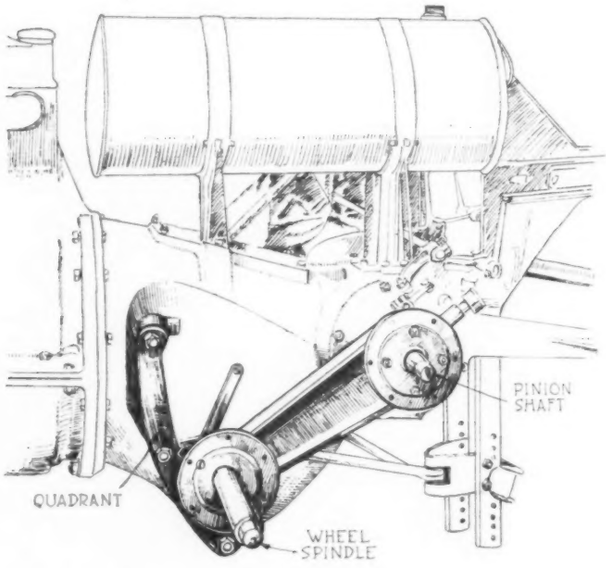
On 52-in. wheels, disregarding slippage, the tractor trav-



Moline two-bottom plow hitched to a model D tractor

els 2.8 miles per hour at 1400 r.p.m. of the engine; 3.2 miles per hour at 1600, and 3.5 per hour at 1800 r.p.m., the maximum engine speed. The wheel is raised and lowered practically automatically, no jack being necessary. The left driving wheel spindle is secured to an arm which swings around the axes of the differential shaft. An adjusting sector is secured to the side of the transmission housing, this sector having on its inside edge a number of notches into which the arm can be locked by means of a trip lever. If the engine is running, the clutch is let in, and the trip lever is then pulled, the engine will raise the weight of the tractor and automatically lower the wheel. The reverse operation is also automatic, as raising the wheel means lowering the tractor frame, and the weight of the frame takes care of that.

Among the claims made for the new model D tractor is that it steers and handles very easily. The manufacturers express their belief in increased speed for farm tractors, as it permits of the same machine being used for light work.



Showing means provided for raising and lowering left-hand wheels

New Pfalz Single-Seater Scout

ONE of the latest models of German aircraft to make its appearance on the battle front is the Pfalz Scout, which is of the type that has come to be known as the plane and a half. This type is characterized by a large top plane and a smaller lower plane. In some of the previous models of this type, like the Albatross, two struts connect to the lower plane in a single point, but in this detail the Pfalz is different, there being a short horizontal distance piece between the lower ends of the two struts. The small lower plane is made with two spars instead of a single center spar, and is therefore a compromise between the single-spar type and the regular two-spar plane, in which the spars are placed the same distance apart as in the upper plane.

One feature of the Pfalz reminding one of the Albatross is that the upper wings are formed in a single piece, and are, of course, without any dihedral angle. The top planes are secured to struts sloping upward from the fuselage. A somewhat novel idea is embodied in the method of securing the lower planes to the body. At the point of attachment there is an inflexion in the curvature of the body outline, the surface of the body swinging outward and gradually merging into the wing surface. That part of the body extending toward the wing may be regarded as a wing root.

The body or fuselage of the Pfalz is of elliptical section, deep and narrow. This has the advantage that both the engine and the pilot are practically entirely within the body, thus reducing the head resistance to a minimum. The narrowness of the body also minimizes interference with the pilot's view. Body construction is of the semi-monococque type, the body being covered by two thicknesses of three-ply wood put on diagonally in long, narrow strips, one strip crossing the other at an angle of about 90 deg. The tail planes are somewhat unusual in that their top surface is flat while the lower surface is convex. Just what the object of this deviation from conventional practice is would be hard to say.

The engine fitted to the Pfalz Scout is a 160-hp. Mercedes, and it is very well housed in, only the upper ends of the cylinders projecting from the cowling.

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WE have received a copy of a circular describing the Hastee patch, a new product of S. C. Johnson & Sons, Racine, Wis. This patch serves as a quick and permanent repair for tubes, casings and rubber goods of all kinds. The patches are put up in three sizes.

The Albatross Fighting Biplane—III

THE manner employed of forming bearings for the elevator is indicated in the diagrams of Fig. 10. A steel strip is bent over the tube, and its two free ends are bent over and fit into slots in the trailing edge of the tail plane. Each clip is then secured to the tail plane by a vertical bolt as shown in the diagram. The trailing edge of the tail plane is spindled out to a semi-circular section as shown, and a curved metal distance piece is screwed to this trailing edge or spar, so as to form the second half of the bearing of which the bent steel strip forms the other half. To remove the elevator the bolts securing the clips are undone; the clips are then bent outward until their free ends clear the slots, when the elevator can be removed bodily.

As the elevator is built of steel tubing throughout, wood blocks of the shape shown in detail 1, Fig. 10, are employed for attaching the fabric covering. These blocks span over the steel strip bearings, and are secured to the tubular leading edge of the elevator by screws as shown in section *B-B*. A hole in the opposite wall of the tube serves for the insertion of the screwdriver.

Under the horizontal stern post of the body are two short tube stumps, closed at their lower ends. The object of these is not at first apparent, since they appear too short to protect the elevator, but when it is remembered that the Germans favor transportation by road, trailing the airplane behind a truck, it becomes at once evident that these stumps serve to support the stern of the body on the floor of a truck while the machine is trailed behind on its own wheels.

As regards the remaining details of the tail of the Albatross, little need be said, as they are fairly evident from the plan and sections of Fig. 11. It will suffice to point out a rather ingenious construction of the leading edge of the tail plane. In plan the tail plane, it will be seen, is roughly semi-circular, and its leading edge therefore has to be shaped to this curvature. As an ordinary strip of solid spruce spindled out to a semi-circular section would scarcely be strong enough for this work, a different method has been employed. It appears that originally the leading edge of the tail is made up of four laminations of ash, having, of course, their grains running in slightly different directions. The rectangular section spar thus formed is then spindled out to a semi-circular section, as shown in the diagram, leaving the impression that the leading edge is made up of seven thin strips of wood glued together. The resulting leading edge appears to be one of great strength, and at the same time quite light.

The cockpits of the Albatross are arranged in the fashion now universally adopted for two seaters by the Allies as well as by the enemy, *i.e.*, the pilot in front of the gunner in the rear cockpit. In the Albatross the pilot seat is mounted on the main fuel tank, which has two projections on top, one on each side of the seat. This arrangement is clearly indicated in Fig. 12, in which the small clips preventing the seat

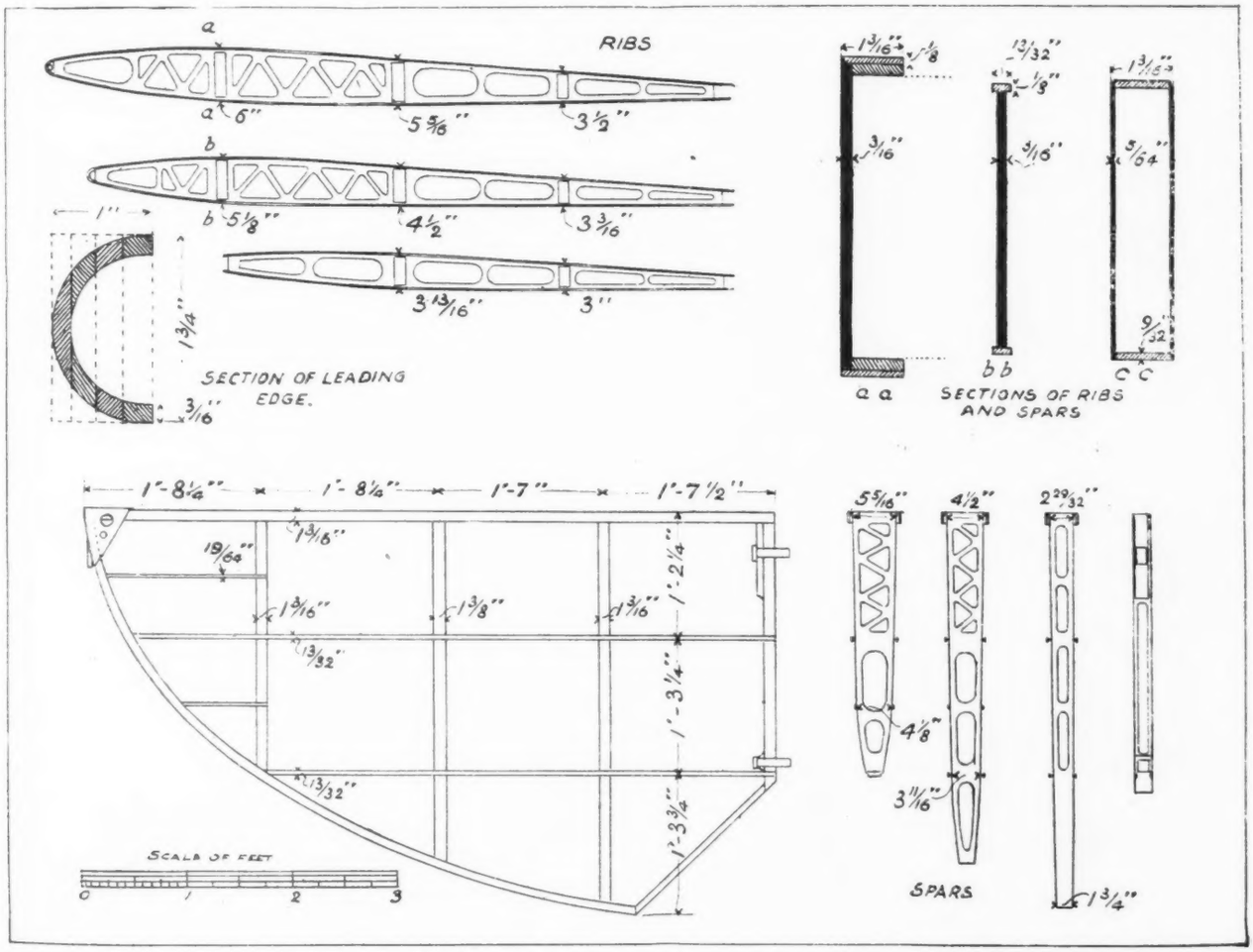

Fig. 11—General arrangement and dimensions of the members of the tail plane on the Albatross biplane

from sliding about on the tank will be noticed. The filler cap is mounted on a tubular projection extending through the fuselage covering, thus enabling the tank to be refilled from the outside. A smaller auxiliary tank is mounted above and to the rear of the main tank, in the gunner's cockpit. Both tanks are connected up to a by-pass or distributor, so that both or either tank can be connected up to the engine, two pumps being provided for maintaining the necessary pressure, one driven by the engine and the other hand operated. Thus, whatever tank is being used, gasoline is fed to the carbureter under pressure. This is probably a necessary provision, as the tanks are placed relatively low, and gravity feed would, therefore, be apt to be unreliable when the machine is climbing at a fairly steep angle.

Constructionally, the fuel tanks are of interest in that they have been internally braced by rods, running across from side to side, the attachment of the rods being visible on the outside of the tank as shown in Fig. 12. To prevent the fuel from slushing about inside when the tank is nearly empty, baffle plates are fitted dividing the main tank longitudinally into five compartments, communicating with each other through the circular openings shown in the section of the tank, Fig. 12. As the supply pipe leaves the tank fairly high up—it can be seen on the front right-hand side of the tank in Fig. 12—it is carried down inside to the bottom of the tank so as to enable the last drop of fuel to be forced out and into the carbureter. The main tank is mounted on brackets as shown in one of the sketches, and is secured by metal straps having an arrangement for adjustment.

In Fig. 13 is shown the general arrangement of the controls. There is a transverse rocking shaft on which are mounted at each end crank levers for operating the elevators, while in the center, pivoted so as to be free to rock laterally, is mounted the main control lever. Mounted on the transverse shaft, but not moving with it, is another lever, which operates the claw brake mounted on the axle. By pulling the lever the free end of the claw brake is pulled upwards,

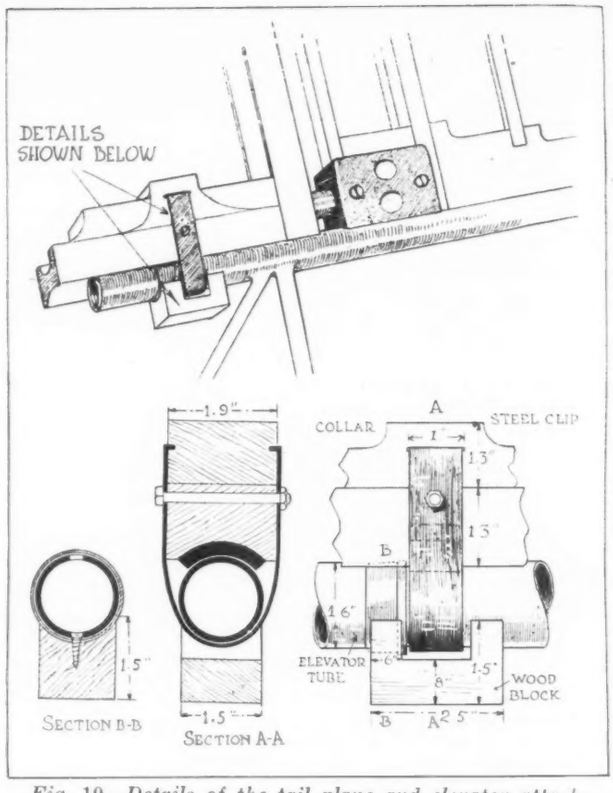

Fig. 10—Details of the tail plane and elevator attachment of the Albatross biplane. Above—Sternpost of the fuselage and tail plane trailing edge

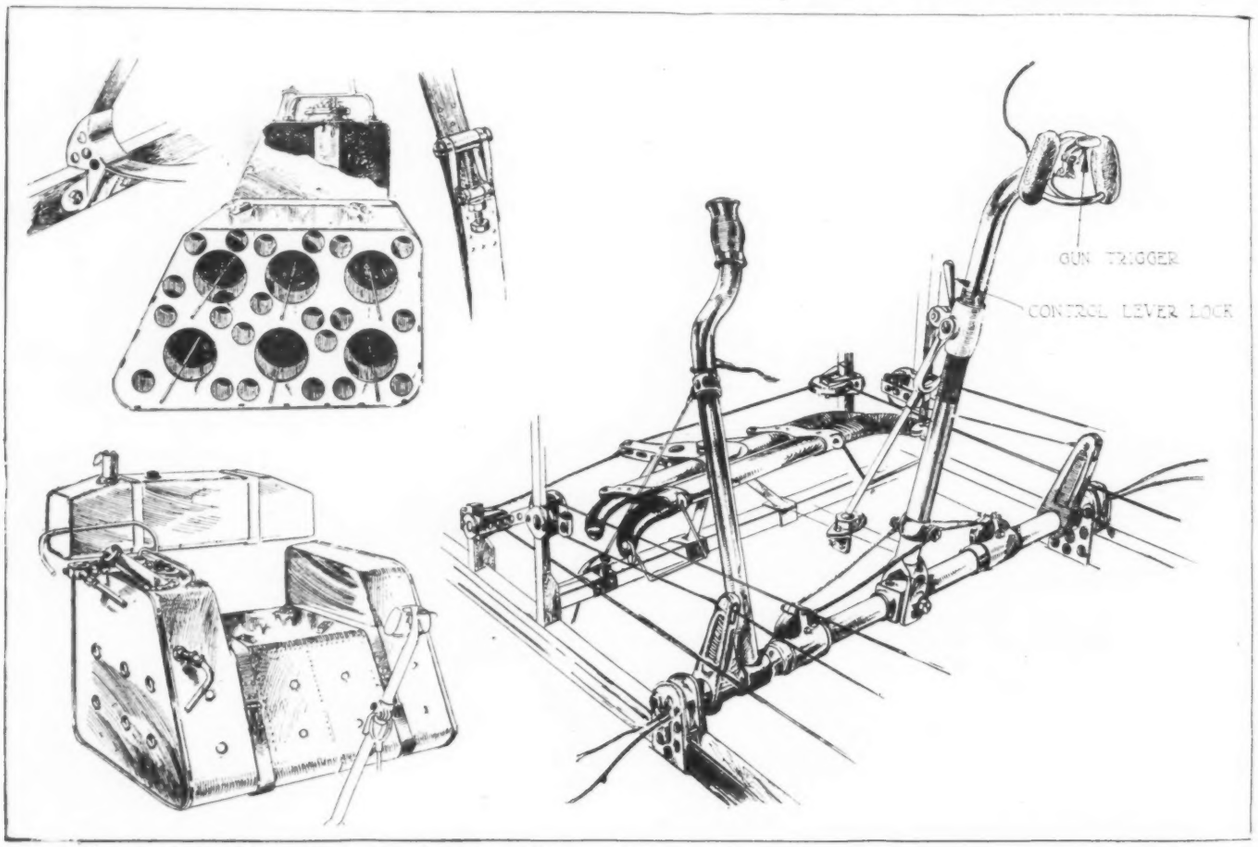

Fig. 12—Left—The main fuel tank of the Albatross biplane. The pilot's seat is placed in the recess, and is prevented from sliding about by the steel clips shown. Above is shown a section of the tank, with the internal bracing rods and baffle plates. Fig. 13—Right—The controls of the Albatross

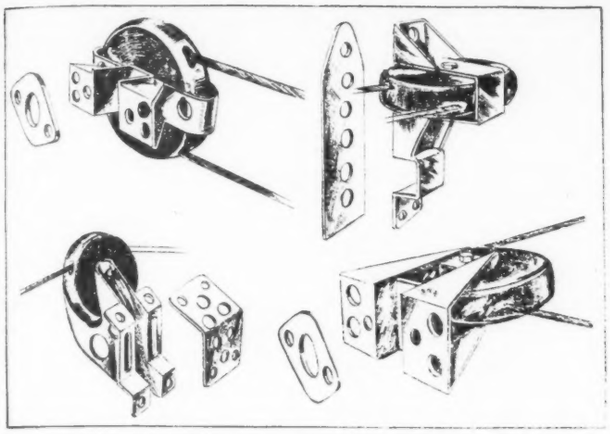

Fig. 14—Pulleys over which elevator control cables pass

thus causing the claw to dig into the ground. On releasing the lever, the brake is returned to its normal position by the action of the spring shown in the sketch.

The transverse rocking shaft is carried in two bearings. A forward and backward movement of the control lever causes the shaft to oscillate, and with it the two crank levers to which are attached the elevator control cables. These cables run from the crank lever, around a pulley slightly forward of the transverse shaft as shown in the sketch, and thence to the top crank lever on the elevator. The return cable runs from the crank on the under side of the elevator to the crank on the transverse shaft. En route these cables pass over pulleys mounted in the rear portion of the fuselage, these pulleys being shown in some of the accompanying sketches (Fig. 14).

As regards lateral control, the general arrangement of this is indicated in diagrammatic form in Fig. 15. From the control lever the direct cable passes over a pulley on the transverse shaft, along through the bottom wing, around another pulley in the wing, and thence to the rear half of the aileron crank lever. The return cable runs from the front half of the aileron crank lever, around another pulley in the lower wing, through the wing and through the transverse shaft to a pulley on the other side of the control lever, and thence to the screw on the control lever. The details will be clear from Fig. 13.

The foot bar operating the rudder is mounted on a pyramid of steel tubes, and the rudder cables are taken, not, it will be seen, from the foot bar itself, as is generally done, but from a short lever projecting forward at right angles to the foot bar. From this lever the cables pass over pulleys and to the cranks on the rudder. It will be seen that provision has been made for making adjustments of the foot bar to suit pilots of different height by fitting an extra foot bar. If the machine is to be flown by a taller pilot, this is removed and the main foot bar used. Wire clips are provided, it will be noticed, for accommodating the pilot's heels

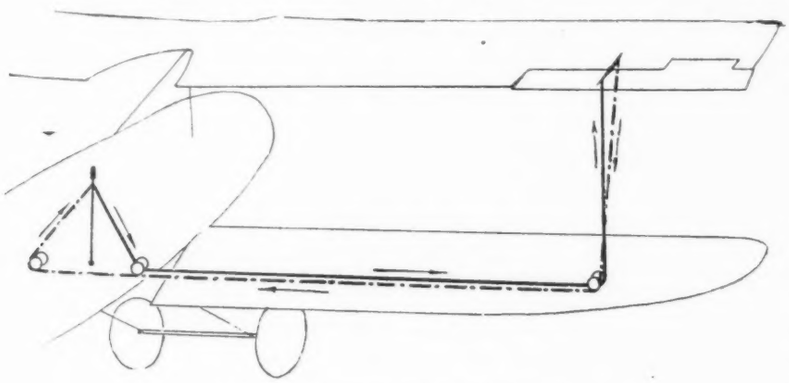

Fig. 15—Diagram of lateral control

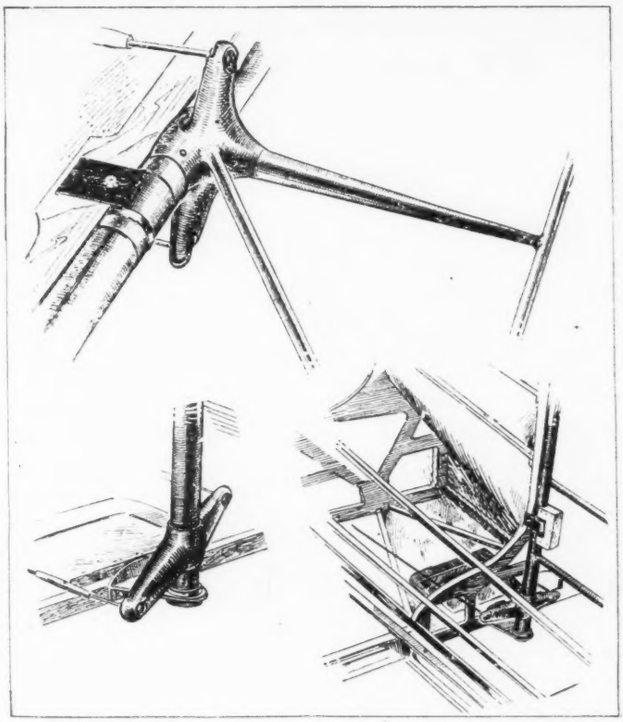

Fig. 16—The elevator and rudder crank levers on the Albatross biplane. The upper sketch shows the elevator crank lever with its ball and socket joint for the turnbuckle. The lower sketches show the mounting of the rudder, the detail being an enlarged view of the lower end of the bottom rudder bracket

so as to prevent his feet from slipping off the foot bar.

As in the majority of German machines, provision has been made for locking the control lever in any position, either flying level, climbing, or descending. This is accomplished by means of a collar free to slide along the control column, but being split and provided with a bolt for tightening up, when the collar is locked in position on the control column. Anchored to this collar by two screws is a fork end, from which a tube runs down and forward to terminate in a ball and socket joint secured to the bottom of the fuselage. This ball and socket joint, it will be seen, enables the control column to be moved freely in any direction, and to allow it to be moved from side to side, even when the forward movement of the column is prevented by locking the collar. In this manner, the pilot can lock the elevator, while operating the control column from side to side for lateral control with his knees.

As far as can be ascertained, although the machine gun was not in place on the machine as exhibited, one synchronized machine gun was fitted, resting on top of the fuselage on the right-hand side. The pilot operated this gun by means of the trigger on the hand-grip of his control lever, which is shown inset in Fig. 13.

(To be continued)

MOTOR tractors are now being used to expedite farm work on a rubber plantation of some 20,000 acres in Sumatra which is controlled by one of the largest tire manufacturing companies in the United States, says the *Commercial Motor*. Before the tractor was put into service it required 250 coolies to plough three acres a day; the tractor at present in use is cultivating 20 acres of land in the same time.

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The Automobile

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Production's War Phase

AUTOMOBILE manufacture under war conditions presents a problem so complex that there is good reason for wide variation in policy and opinion. As far as the larger companies are concerned there is little reason why they should have any direct financial worries. On the other hand, the problem of taking care of the distributers so as to keep them in business and to maintain the standing with the distributer and the community in general, which the manufacturer has built up during past years, is extremely difficult if not impossible of solution.

The manufacturing side of the story is simply a matter of change over from peace production to war production. Where receipts formerly came from peace products they now come from war products, and though they may have shrunk somewhat, they are nevertheless sufficient to cover manufacturing expenses. In place of streams of passenger cars, there are streams of motor trucks and airplane engines, besides ordnance parts and a great variety of other products peculiar to war manufacture.

A few examples will serve to illustrate the point made: At this time a year ago Cadillac was producing over 100 cars a day; to-day it is producing 60. Ford produced 3200 a year ago and to-day produces 1550. Maxwell has dropped from 400 to 300; Overland from 640 to 400. The factory capacity thus set free is devoted to products of a warlike nature which a year ago were not manufactured.

The Hvid Engine

IN view of the many complaints of unsatisfactory operation of so-called kerosene tractor engines and the acknowledged difficulties in completely burning kerosene in an engine designed to operate on the ordinary Otto cycle, it may be necessary in the future to consider other types of engines for truck, tractor and marine work, so as to be able to use cheaper fuels. Some consideration has been given, indeed, to the Diesel engine, but the difficulties involved in adapting it for such small powers as required, especially on the smaller trucks and tractors, seem enormous. Not only must the pistons and valves be made to hold compression pressures approximating 500 lb. per square inch, but a fuel pump is needed which will accurately deliver the minute quantity of liquid fuel consumed during each power stroke. Another difficulty is in regard to starting the engine. This requires turning the engine over compression, which is from six to eight times as high as in an Otto engine; hence the starting operation requires an effort beyond the powers of the average driver.

Many of these inherent difficulties of the Diesel engine are overcome in the Hvid engine, a description of which appeared in AUTOMOTIVE INDUSTRIES some months ago. The Hvid is a development of the Diesel and it is but natural that it should have been introduced first in the field in which the Diesel had made a place for itself, namely, that of stationary engines. But as experience with it in this line of work is accumulating and the need for using cheaper fuels in automotive equipment becomes more imperative, attempt will no doubt be made to adapt this new engine to truck and tractor work. That automotive engineers have begun to interest themselves in the engine is indicated by the fact that a paper on it was read at a recent meeting of the S. A. E. Mid-West Section. The paper consisted mainly of a description of the working principle of the engine and of the claims made for it, and as this material has already been given in these pages, we do not consider it advisable to abstract or reproduce the paper here.

As a stationary engine the Hvid is essentially a constant speed engine. Changes of load can be readily taken care of by varying the amount of fuel supplied, but how the engine would behave under wide variations of speed seems as yet to be an open question.

To develop an engine of this type for automotive purposes would require the talents of engineers familiar with the design of automobile or truck engines, as engineers who have worked only on stationary engines find it very difficult to eliminate all unnecessary weight, this requirement not being met with in the design of power plant engines. We understand that quite a number of concerns have taken licenses under the Hvid patents with the intention of manufacturing the engine for stationary work. If it were not for the fact that just at this time there is practically no engineering talent and no capital lying idle there would seem to be an excellent field for some well-financed concern to take up the development of this engine for automotive work.

The Forthcoming S. A. E. Meeting

AT the last winter meeting of the Society of Automotive Engineers the event which aroused the greatest interest was the discussion of the Liberty engine design by the men responsible for it. At the meeting in Dayton next week another step forward in the development of this engine will be marked by the presentation of test results obtained in officially conducted tests under S. A. E. auspices. The meeting is conceived on somewhat original lines, as it will be largely an exhibition of war engineering methods and products. Those who attend the meeting will probably absorb more new ideas through their organs of sight than through those of hearing. War engineering in this country has reached a stage where the results are beginning to show. The individual engineer attached to any particular branch of the service or engaged in private work has ordinarily very little chance to acquaint himself with the different lines of work that is being carried on, but this opportunity will be given him at Dayton.

In the selection of papers to be read at the meeting the greatest prominence has been given to papers on aircraft and tractors. These are the two lines of most intensive development at the present time and it is fit that they should be given preference on the program. Men in intimate touch with both lines of work will be in attendance and those seeking information regarding latest developments in these fields will undoubtedly be able to get it at Dayton.

Roads and Waterways Needed

NOTHING has shown more clearly the necessity for increased national efficiency than the war. The country which maintains its interior lines of communication and transportation at the highest point of usefulness is the best prepared for war or peace. This lesson has already been brought home to us very strongly in connection with the transportation problems of this country. The government has taken over the railroads and is operating them; it has encouraged the use of motor truck transportation and is extending plans for inland waterways to an extent not before conceived of.

When we have our country provided with a network of the best of roads and canals we will have made the United States a nation even stronger than it is at the present time.

At present the man power is not available to carry out extensive plans of improvement. After the war, however, there will be hundreds of thousands of soldiers returning whose future must be looked after to a large extent by the government and by the people who have been so faithfully served by them. No better use could be found for many of these men than in the great engineering works necessary to promote increased internal efficiency of the country. We now have an organization tuned up for $12,000,000,000 work a year. This has been the cost to us of the first year of war. If this destructive work be compared in expense with the constructive work of building the Panama Canal, which cost $325,000,000, it will be readily perceived that the work of peace necessary to improve the internal transportation system of the country will be nowhere near as expensive as that of carrying on the war. With these improvements, automobile, marine and railway transportation will reach a new plane of development and the distribution problem, which is really the heart of the problem of living-cost, will have been largely solved.

The British Steel Situation

FROM one of the papers read before the Institution of Automobile Engineers at London this session, on the present steel situation in Great Britain, it appears that British automobile manufacturers are having the same difficulties with respect to obtaining materials of the proper quality and in sufficient quantity as is experienced by their American confreres. British steel makers have repeatedly been charged with lack of enterprise by automobile manufacturers, and four years ago much of the alloy steel used in British cars came from the Continent. To-day the aircraft demands must be met first, and what is left is often of very indifferent quality. Automobile steels were standardized in Great Britain by the Engineering Standards Committee more than three years ago, but it appears that steel makers refuse to accept these standards. The steel makers of Great Britain, like those of every other warring country, are loaded up with orders and it would appear from statements made in the paper referred to that sometimes when an order comes in for bars of a particular size and specification, if the right size is not in stock in the specification wanted they substitute a steel with either more or less carbon than that called for. Thus case hardening nickel steel has been furnished which contained 0.35 per cent of carbon, whereas any steel with more than 0.15 per cent of carbon is considered unsuitable for the purpose.

It should be pointed out that automobile manufacturers require steel for Government work only, as no automobiles are being made for private use in Britain at present.

Latest News of the

Standards Divisions Subjects

Aeronautic, Marine, Tractor and Other Sections to Meet Saturday, June 15

NEW YORK, June 5—Several division meetings of the S. A. E. Standards Committee will be held at Dayton, Ohio, on Saturday, June 15, at the Engineers' Club. These meetings are necessary to permit the various divisions to make full and complete reports to the Standards Committee, which will meet on Sunday. All of the division meetings are set for 10 a. m.

Probably the most important meeting of the session will be that of the Aeronautic Division, which will discuss, under the head of Aircraft Screws and Bolts, such items as bolt diameter limits, bolt head and nut diameters, thread pitches, turnbuckles, swedged wire ends, clip ends, clevis pins. Each of these items has been under consideration by a subcommittee, and the division will review the report of the sub-committee and approve it for transmission to the Standards Committee.

The meeting is also scheduled for the Iron and Steel Division. The most important subject to be considered by this division is that of screw stock. The American Society for Testing Materials has submitted to the S. A. E. two specifications for Bessemer and openhearth screw stock, which they will recommend for adoption at the June meeting of the A. S. T. M. A comparison of the existing S. A. E. specifications and the two proposed new specifications is given on page 1112.

Copies of the A. S. T. M. recommendation have been sent to the members of the Iron and Steel Division, and the replies in general indicate that the specification is acceptable. However, some members on the committee have suggested slight changes in them.

Four subjects will be dealt with by the Marine Standards Division, namely, propeller shaft couplings, engine base dimensions, swing port-lights and fixed portlights. The three last mentioned subjects have been handled by sub-committees and the division will review their report and transmit these reports to the Standards Committee.

Quite a lengthy program has been set down for the meeting of the Tire and Rim Division, which will review tires and rims for airplane landing wheels, valve holes in rims, simplification of pneumatic tires and rim sizes for passenger cars and commercial vehicles, wood felloe dimensions, spoke dimensions for wood truck wheels, routine test of rims, carrying capacities and inflation pressures, rim sections (base bands) for solid tires. In connection with some of these items a report already drawn up is merely to be ratified, while in connection with others a report of a sub-committee is to be reviewed and approved.

The Tractor Standards Division apparently also has been very busy since the time of the winter meeting. It will review its report concerning a complete specification form, and will also take action on a number of other subjects, including steel and shafting sizes, carbureter flanges, pipe marking, pulley belt widths, screws and bolts and the use of existing S. A. E. standards.

Generator bracket mounting is the most important subject on the program for the meeting of the Engine Division. This division will also consider engine supporting arms, hand-starting cranks,

(*Continued on page* 1112)

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To Separate War Industries Board

WASHINGTON, June 5—The War Industries Board, as predicted in an earlier issue of AUTOMOTIVE INDUSTRIES, has been separated from the Council of National Defense, under order by President Wilson, based upon the Overman bill. The reason for this lies in the fact that the board has outgrown the council both in size and importance and will function more efficiently as an independent body.

The board will exercise supervision of the industrial fabric of the country, commandeer plants when necessary and take other drastic steps to speed up production. It will direct all purchases for this country and the Allies. Its powers include the allocation of materials, curtailment of certain industries and price fixing.

The Food Administration, using a building adjoining the Council of National Defense, will move soon, and the War Industries Board will take over its building.

The Council of National Defense will operate on a smaller scale than in the past, devoting its energies mainly to the co-ordination of the various state councils, industrial training, labor, etc.

—

May Shift Aerial Landing

WASHINGTON, June 5—The aerial landing at Belmont Park, Long Island, N. Y., now used by the airplane mail service, may be shifted to Branch Brook, near Newark, N. J. This site is now being inspected because its location offers better facilities for transferring the mail to the New York post office.

Canada Puts Up Bars Against Cars

Classes Those Costing Over $1200 as Non-Essential and Prohibits Imports

NEW YORK, June 5—Canada has definitely placed automobiles costing more than $1,200 in the luxury class. Under the terms of an Order-in-Council it is forbidden to import automobiles costing $1,200 or more f.o.b. the point of manufacture without a license from the Ministry of Munitions recommended by the War Trade Board. This virtually amounts to an embargo.

The Order-in-Council includes automobiles among nearly 1000 other articles which are classed as being non-essential during the continuance of the war. The action appears to have been taken primarily as a means to protect Canadian industries and not by reason of lack of transportation or for other reasons.

During the 10 months ended in April, 1918, Canada imported from the United States 11,700 automobiles valued at $9,098,439 and 849 trucks valued at $1,096,492. For the month of April Canadian imports from the United States touched 1815 automobiles valued at $1,574,821, and 142 trucks valued at $208,998. During the calendar year of 1917 Canada imported 16,458 American automobiles valued at $12,401,705.

Canadian import duties at present are very heavy. In addition to the regular duty of 35 per cent there is an extra import duty of 11½ per cent as well as a special internal revenue tax of 10 per cent.

—

To Investigate Airplane Accidents

WASHINGTON, June 6—There will be an investigation by a special committee of Congressmen into the causes of accidents in the American aviation training schools, according to a resolution introduced in the House of Representatives yesterday. The resolution says: "It is reported that some at least of the accidents at the American aviation fields were due to the defective construction of the airplanes and in no wise to the fault or negligence of the aviator." The sum of $5,000 is authorized to pay the expenses of the investigation. The speaker is to name the committee.

The committee will make recommendations for action for the prevention of such accidents in the future. The resolution specifies that nothing in it will authorize the committee to take over in any manner the executive branch of government in the conduct of the war.

Automotive Industries

Bijur Interferences Not Allowed

Court Decides Vincent Bendix Is First and Original Inventor—Five Suits

WASHINGTON, D. C., June 3—The United States Patent Office has rendered a decision to the effect that Vincent Bendix is the first and original inventor of all the features and improvements which have made the Eclipse-Bendix starter drive the practical and commercial success that it now is. The decision is an outcome of a series of interference cases in the Patent Office in which interference suits were instituted by Jos. Bijur of the Bijur Motor Lighting Co., the Westinghouse Electric & Mfg. Co., through Frank Conrad; and the Northeast Electric Co., through Edward A. Halbleib. Under the decision, the claims of these concerns for priority of invention are not sustained, the decision being to the effect that they are not entitled to patents on the features claimed.

The decision not only sustains the Bendix patents but deprives Bijur, Westinghouse and Northeast of the right to employ in their devices the construction covered in the Bendix patent.

For a number of years the manufacture and sale of the Eclipse-Bendix drive has been carried on by the Eclipse Machine Co., its sale being handled through Brandenburg & Co.

Hundreds of thousands of this device have been built to date. During the past year, Bijur has been manufacturing a device which under these decisions would be considered an infringing device. Westinghouse and Northeast have not manufactured any device to date but have been purchasing the Eclipse-Bendix drive.

Five broad interference suits have entered into this case in the Patent Office and the points broadly covered are as follows, in each of which Vincent Bendix has been awarded priority of invention of the subject matter in issue:

1—One interference related to the use of a counterbalance pinion which was needed to cause the pinion to travel along the threaded shaft so as to engage with the tooth and the flywheel.

2—The second interference case covers the use of a spring for a form of yielding connection between the threaded shaft on which the pinion travels and the armature shaft of the starting motor. The purpose of the spring is to relieve the starting shock on the battery as well as on the mechanical construction entering into the device.

3—The third interference suit relates to the use of right angle stops on the threaded shaft carrying the traveling pinion, these stops being used in order to prevent binding of the pinion on the screw shaft at the end of the threads.

4—The fourth interference suit relates to that design in which the traveling pinion moves toward the starting motor when engaging with the teeth on the flywheel and which is known as the inboard type as compared with the opposite design known as the outboard type in which the pinion travels away from the starting motor when it engages with the flywheel teeth. The inboard type eliminates the use of an outer bearing. This interference suit also covers the yielding endwise movement of the screw shaft in case the pinion teeth and flywheel teeth should abut end to end, before engagement. There is a companion interference on this point.

The Bendix patents which have been sustained in these interference suits are as follows:

No.	Issued
1,124,264	Jan. 12, 1915
802,694	Jan. 26, 1915
1,125,935	Jan. 26, 1915
1,116,369	Nov. 10, 1914
1,134,975	April 6, 1915
856,055	Nov. 10, 1914
1,116,370	Nov. 10, 1914
835,970	Consolidated in the suit
804,526	Consolidated in the suit

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Keystone Acquires Gryphon Plant

NEW YORK, June 3—The Keystone Tire & Rubber Co. has taken over the plant of the Gryphon Tire & Rubber Co. in this city. This plant is at present turning out 200 tires a day, and this will be increased to 500 within the next few weeks. By the beginning of 1919, an output of 1000 tires daily is expected. The Gryphon factory was acquired on a cost-plus basis, and the Keystone company is planning to acquire three additional factories on the same basis. By this arrangement, there is no investment in plant or equipment. The finished product will be paid for when it is delivered.

—

Say 20 Per Cent of Steel May Go to Non-War Industries

WASHINGTON, June 3—Certain government officials have stated that the Government will not need more than 80 per cent of the steel output and that the remaining 20 per cent will go to non-war industries. There are rumors, on the other hand, that the entire output will be used for war work. Therefore, there is considerable confusion about the steel situation. The government's steel needs have been compiled, but no definite information is available.

Airplane Probe Is Progressing

Senate Committee Visits Plants —1300 Planes and 2000 Liberty Engines Shipped

WASHINGTON, June 3—The investigations of the aircraft situation both by the Senate and the Department of Justice are progressing. The aviation subcommittee of the Senate Military Affairs Committee, which is investigating aviation, left here yesterday for a week's inspection of airplane factories. The itinerary was kept secret and newspaper men were requested to withhold all information from the public regarding the journey. The reason is that the committee does not desire to give the airplane manufacturers the advance notice of their arrival. Another tour is anticipated later.

Charles E. Hughes and Assistant Attorney General W. L. Frierson of the Department of Justice, investigating the aviation charges are holding secret examinations of Signal Corps officers. All information as to the names of the witnesses and the nature of their testimonies has been withheld.

Thirteen-hundred airplanes, made of American materials by American mechanics in French factories, are now operating with the American Army in France. Of these, 323 are combat planes. Manufacture of bombing planes is also increasing steadily. Production figures are:

Up to May 11	14
Week ended May 18	34
Week ended May 25	37
Total	85

A total of 2000 Liberty airplane engines have already been manufactured, and distributed as follows:

United States Army	561
United States Navy	480
Allies	959

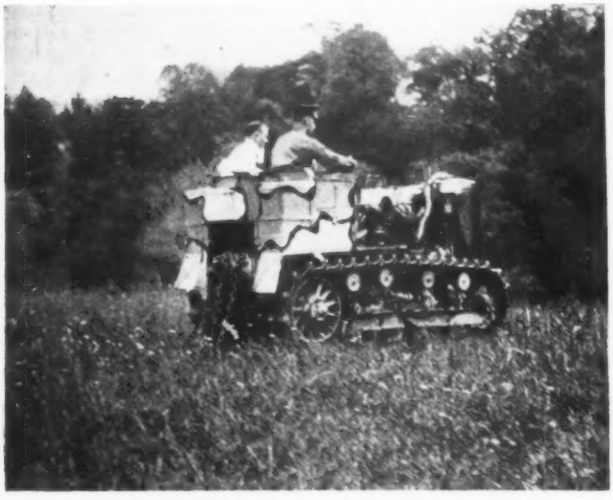
In the last 4 weeks a substitute for the castor oil used for airplane lubrication has been found that utilizes 10 per cent of castor oil and 90 per cent of the raw oil, for use in the Liberty engine.

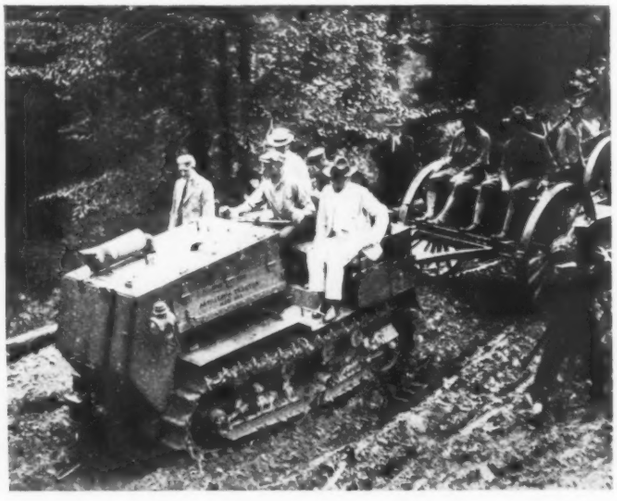
These and other facts developed yesterday in hearings on the new army appropriation bill calling for $1,000,000,000 for aviation. Many congressmen and especially Republicans and Progressives were inclined to question the Liberty engine and our airplane production and expenditures. They were answered by Congressmen Kahn and Dent. Ridiculous

(*Continued on page* 1113)

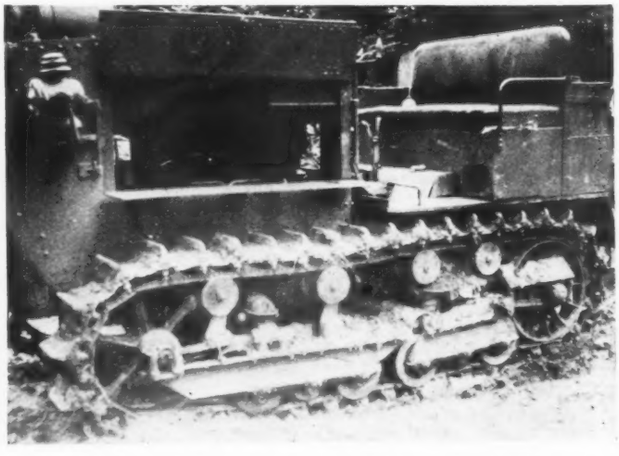
Putting the 5-Ton Standardized Tractor Through Its Paces

The tractor had little difficulty in climbing over a log. Other tests included climbing through trees and through mud where the gun carriage wheels sank up to the hubs. The photograph at the right shows the tractor after the log had been cleared





Secretary Baker, General Peyton C. March and many Congressmen and British and French army officials were present at the demonstration. General March is the passenger in the photograph at the left, and Secretary Baker is riding on the tractor shown on the right



The tests included hauling a 6-in. howitzer on a gun carriage and foreshadows an almost complete motorization of the American army's field artillery. The photograph at the right shows the lugs. These are so arranged that fourteen are in contact with the ground at one time

Standardized 5-Ton Tractor Demonstrated

New Artillery Model Designed and Completed by Ordnance Department Is Successfully Tested in Washington

WASHINGTON, June 3—There was held here to-day a demonstration of the standardized 5-ton artillery tractor recently designed and completed by the Ordnance Department and announced several weeks ago in AUTOMOTIVE INDUSTRIES. Secretary of War Newton D. Baker, General Peyton C. March and many Senators, Congressmen and British and French army officials were present. The tests, which were successful, were held in a ravine in an outlying section of the city, where the mud was 12 to 16 in. deep.

Made by Reo and Maxwell

The tractor, including the Liberty Class B truck engine with an overhead valve arrangement, is being manufactured by the Maxwell and Reo companies. It weighs 9000 lb. and carries smooth chains for driving over pavements, and is so arranged that lugs can be attached to the driving chains in 15 minutes by 4 men, to enable it to pull through mud or obstacles. There are 14 lugs in contact with the ground at one time. The engine develops 55 hp. and propels the tractor at from 2 to 12 m.p.h. Six thousand of the tractors have been ordered, and several have been completed and undergoing tests for some time. The one used in the demonstration to-day has more than 3000 miles of service to its credit.

Hauls Gun Carriage

During the tests the tractor, hauling a 6-in. howitzer on a gun carriage, climbed down and up a 45-deg. grade. In the climb up two tractors of the same type were used, the one, camouflaged, also exhibiting turning powers by revolving at high speeds in the brush and grass. Other tests included climbing through trees, over logs and through mud where the gun carriage wheels sank up to the hubs.

Major W. G. Wall, at one time chief engineer of the National Motor Car Co. and now an officer of the Ordnance Department, just returned from Europe, witnessed the tests of the tractor and said that it was far superior to anything in use across the water. He stated that none of the Allies has developed a pulling tractor of the speed, efficiency or power of the new one tested here today. The French have only manufactured good carrying tractors. The British tractors are unwieldy, twice as large as the American tractors and capable of no greater power.

It is stated that the tractor tested today will not be the chief artillery tractor, and that a tractor of 50 per cent greater power but embodying the same principles will be manufactured to perform the greatest part of the tractor work abroad.

Field artillery of the American army will be motorized to a greater extent than the artillery of any other army in the war. It will be considerably improved over that of any other army in design and scope. The superior design will make possible a broader field of operation and greater elimination of horse and man power. The tactical advantage of field artillery motorization lies in the ability to bring up artillery speedily, and to always be prepared for improvement of defense or counter offensive attacks. There are also other advantages; for example, a horsed regiment of 6-in. howitzers consumes 14.7 tons forage per day whether the animals are being usefully employed or idle. A motorized regiment of the same weapon consumes 4 tons of fuel, oil and grease in moving 50 miles in one day, which represents 2 days march for a horsed regiment, and when idle the motor transport consumes no fuel, oil, etc. Moreover, the space occupied in transporting fluids as compared with oats and hay, and the space required for the transport of one tractor in comparison with the space necessary to transport 16 heavy draft horses, makes the use of motor equipment a means of saving cargo on overseas transports.

Possible Output Unlimited

The possible output of tractors for the transport of field artillery is practically unlimited. The supply of horses is becoming more limited each month. Tractors and motor equipment are easier to conceal and camouflage than horses. The use of tractors also conserves leather, the supply of which is now a serious problem.

The chief problem of motorization of field artillery has been with light rather than with heavy artillery because the light artillery must travel over shell holes, through mud, wire entanglements, etc., at a comparatively high speed, and it has been a problem to develop motor equipment for this work.

The Ordnance Department has succeeded in developing types of tractors so that all of the American artillery will be motorized, excepting the 3 in. gun batteries, some of which will be hauled by horses, and the heaviest field artillery, which will be mounted on railroad carriages.

—

Gas Engine Makers Convene

CHICAGO, June 4—How national engineering bodies can assist their government and industries through war service committees was outlined to automobile and gas engineers by Mr. Van Der Broies, secretary of the central district United States Chamber of Commerce, at the gas engine dinner of the Mid-West Section of the Society of Automotive Engineers and the National Gas Engine Association. The dinner marked the close of the 2-day convention of the latter association, and the combined meeting of that organization and the Mid-West Section of the S. A. E.

The technical session yesterday afternoon was featured by an explanation of the Hvid engine by E. B. Blakely, advisory engineer of Sears-Roebuck & Co. There was also a discussion of the mechanical construction of ignition magnetos by H. R. Van de Venter, of the Sumter Electrical Co. A war service meeting of the gas engine manufacturers was addressed by William Butterworth, president of Deere & Co., who outlined the work of the war service committee of the wagon and implement manufacturers.

—

First Tractor Train Makes Trip

DETROIT, June 3—On the first tractor train of the Liberty Highway Co. which left Toledo May 28 were 121,000 lb. of springs from the Mather Spring Co. consigned to Dodge Brothers. Each of the military tractors pulled two trailers, and when on the road the train extended nearly two blocks. The running time between Toledo and Detroit will be about 8 hours. Two trips will be made daily and later it is planned to have half the train leave Detroit while the other half is departing from Toledo. The train will also carry extra freight and express.

—

Packard Ships Thousandth Liberty Engine

DETROIT, June 4—The Packard Motor Car Co. shipped its thousandth Liberty engine last week, just a year from the day on which blue prints and parts of the engine were first sent to Washington.

On May 29, 1917, one of the company's engineers took to Washington a trunk, which was checked as personal baggage. This contained complete blue prints and an all-steel cylinder of an aviation engine. On May 29, 1918, upon the completion of Engine No. 1000, telegrams were sent to President Wilson and Secretary Baker. A reply has already been received praising "the most commendable zeal and spirit with which this task was accomplished."

—

Drive-Aways Slackening

DETROIT, June 4—There are few drive-aways from this territory at present, compared with the number a month ago. Most manufacturers are obtaining all the freight equipment they require. The Paige-Detroit company, as well as Packard, Cadillac, Hupp and others, are sending only a small percentage of their cars over the road.

The Maxwell company is maintaining its drive-away system chiefly to hold its crew organization intact. Sixty cars are driven weekly to the Chicago warehouse, the train usually being made up of 10 trucks, each loaded with passenger cars, and trailing another by means of a bar designed by the company.

April Exports Total $15,710,559

Show Gain of 12 Per Cent Over March, but Are Less Than Those of April, 1917

Mos.	Cars	Value	Trucks	Value	Parts
Apr.	6,104	$3,958,560	655	$1,392,125	$4,004,383
Mar.	4,246	3,981,016	620	1,526,387	2,683,902
		1917			
Apr.	7,300	5,180,343	1,031	2,413,868	3,425,013

NEW YORK, June 5—Exports of automobiles, trucks and parts during March amounted to $9,355,168. This is an increase of 12 per cent over the March total, but far less than the amount exported during April, 1917, when exports aggregated $11,019,354.

The April amount, however, is the largest for 1918, and is consistent with the steady rise since last winter.

No airplanes were exported during April, but the value of airplane parts was $559,436, as compared with $516,439 a year ago. Every item on the export list shows a gain over the March figure, but is less than the April, 1917, figure. When the value of airplane parts, motorcycles, gasoline engines and tires is added to the April figure, the total is $15,710,559 as compared with a March total of $15,087,310.

During April 655 trucks were exported as compared with 620 in March and 1031 last April. Of these 95 went to France, 142 to Canada and 116 to Great Britain. Passenger car shipments numbered 6104, by far the largest single item being a shipment of 1815 to Canada. In March, however, the number of passenger cars sent to Canada was 2276.

Trade with Argentina increased considerably, the value of passenger cars sent to that country being $174,674 in April as compared with $49,520 in March. Chile's purchases, on the other hand, decreased from $186,928 in March to $78,966 in April. Trade with the Orient is also increasing steadily. Australia received 418 cars in April as compared with 248 in March. New Zealand received 235 in April as compared with 19 in March. The Dutch East Indies bought 65 in April and only 1 in March.

During April 10,426 gas engines were shipped as compared with 10,215 in March. The value of the former was $4,694,359 as compared with only $2,275,984 in April, 1917. The value of engines exported was the largest item in the total list. Passenger cars come second, with a value of $3,958,560, and automobile and truck parts, exclusive of engines and tires, come third, with a value of $2,895,600.

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Robert C. Hupp Dead

DETROIT, June 1—Robert C. Hupp, several years ago prominent in the automobile industry, died at Cumberland, Md., on May 24. Mr. Hupp was the organizer and president of the original Hupp Motor Car Co., which was formed in 1908; he was not connected with the present Hupp company. During the first three years of the company's existence he was its vice-president and general manager. Prior to the formation of this company he was for some time connected with the Olds Motor Works, becoming eventually service manager. In 1906 he became connected with the Ford Motor Co., in charge of service and accessories, and in 1907 was placed in charge of production for the Regal Motor Car Co.

ChamberUrgesMore Rural Expresses

N. A. C. C. Appoints District Representatives to Interest Makers and Dealers

NEW YORK, June 5—The National Motor Truck Committee of the N. A. C. C. has commenced active work to assist in the establishment of rural motor express lines throughout the United States.

As a starter the committee has issued a series of pamphlets giving in detail a list of services to be rendered by such lines, scale of charges, a simple cost sheet, suggestions for the preliminary survey of roads and canvass of prospective customers, operating plans and general suggestions.

District representatives are being appointed in all of the principal centers and the committee has undertaken to interest in the movement the 115 motor vehicle manufacturing members of the chamber and between 30,000 and 40,000 dealers.

Members of the association have been asked to write letters to 25 dealers each by way of increasing interest in the establishment of these routes, which will mean an increase in the number of trucks sold as well as serving a useful and patriotic service in increasing the distribution of food products:

Following are the names of men who have been requested to act as district representatives:

C. E. Griffin, Pres., Wheeling District Automobile Dealers' Ass'n, Wheeling, W. Va.
C. G. Powell, Secy. and Treas., Omaha Automobile Trade Ass'n, Inc., Omaha.

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for April and Nine Previous Months

	Parts for April and Nine Previous Months.				Months Ending April, 1918			
	1918		1917		1918		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	.....	.....	9	$95,122	18	$192,620	33	$375,536
Airplane parts	.....	$359,436	.....	516,439	.....	6,064,896	.....	2,119,326
Commercial cars	655	1,392,125	1,031	2,413,868	10,490	27,861,763	12,968	36,155,441
Motorcycles	913	192,813	2,356	524,046	.....	26,878,157	.....	21,802,276
Passenger cars	6,104	3,958,560	7,300	5,180,343	47,983	39,610,813	50,500	37,409,446
Parts, not including engines and tires	.....	2,895,600	.....	2,157,999	8,847	207,934	13,842	2,822,566
Tires	.....	1,108,783	.....	1,267,014	.....	10,621,015	.....	9,595,454
Total	.....	$8,246,285	.....	$9,752,210	.....	$94,350,738	.....	$95,367,163
ENGINES								
Automobile gas	2,747	$391,656	3,237	$325,847	31,142	$3,671,877	19,078	$2,352,076
Marine gas	652	210,514	1,056	198,520	6,403	2,114,730	7,280	1,753,775
Stationary gas	3,196	285,534	2,832	356,002	22,506	2,501,196	26,264	2,607,707
Tractor and creeper type gas	3,831	3,806,655	1,240	1,395,615	19,300	19,300,379	5,389	7,054,891
Total Engines	10,426	$4,694,359	8,365	$2,275,984	79,351	$27,588,182	58,011	$13,768,449

BY COUNTRIES TEN MONTHS ENDING APRIL, 1918.

	Passenger Cars		Trucks		Passenger Cars		Trucks	
Argentina	218	$174,674	.....	.....	3,172	$2,270,966	.....	.....
Australia	418	352,585	.....	.....	3,804	2,967,302	.....	.....
British India	.....	.....	.....	.....	57	37,402	.....	.....
British South Africa	18	18,032	.....	.....	1,848	1,454,232	.....	.....
Canada	1,815	1,574,281	142	208,998	11,770	9,098,439	849	$1,096,492
Chile	47	78,696	.....	.....	2,993	3,040,774	.....	.....
Cuba	105	144,539	.....	.....	2,603	2,615,951	.....	.....
Denmark	2	4,100	.....	.....	2	4,100	.....	.....
Dutch East Indies	65	69,822	.....	.....	1,271	1,302,358	.....	.....
France	82	45,630	95	398,954	876	1,055,512	2,369	8,661,814
New Zealand	235	198,957	.....	.....	1,624	1,279,243	.....	.....
Norway	.....	.....	.....	.....	90	94,566	.....	.....
Philippine Islands	420	243,044	.....	.....	1,488	1,174,486	.....	.....
Russia in Asia	.....	.....	.....	.....	5	8,425	.....	.....
Russia in Europe	.....	.....	.....	.....	492	1,136,400	406	1,562,303
United Kingdom	1	2,600	116	403,252	886	1,918,923	4,748	13,237,116
Other Countries	2,678	1,051,600	302	380,921	15,002	10,152,099	2,118	3,304,038
Totals	6,104	$3,958,560	655	$1,392,125	47,983	$39,610,813	10,490	$27,861,763

J. J. Gibson, Secy., Buffalo Automobile Dealers' Ass'n, Buffalo.
Paul LeHardy, Secy., Rochester Automobile Trade Ass'n, Rochester.
H. T. Gardner, Syracuse Automobile Dealers' Ass'n, Inc., Syracuse.
A. A. Ledermann, Pres., Utica Motor Dealers' Ass'n, Utica.
H. A. Bonnell, Secy and Treas., N. J. Automobile Exhibition Co., Newark.
H. W. Bonnell, Secy., Milwaukee Automobile Dealers' Ass'n, Inc., Milwaukee.
B. R. Webb, Pres., San Antonio Automobile Trades Ass'n, San Antonio.
H. O. Brunton, Pres., Cincinnati Automobile Dealers' Ass'n, Cincinnati.
J. M. Gasser, Pres., Toledo Automobile Dealers' Ass'n, Toledo.
J. S. Fassett, Pres., Philadelphia Auto Trade Ass'n, Philadelphia.
W. C. Brown, Pres., Western Automobile Trade Ass'n, Denver.
Geo. D. McCutcheon, Pres., Atlanta Automobile Ass'n, Atlanta.
W. G. Tennant, Secy., Chicago Automobile Trade Ass'n, Chicago.
Bruce M. Wylie, Pres., Indianapolis Automobile Trade Ass'n, Indianapolis.
Dean Schooler, Pres., Des Moines Automobile Dealers' Ass'n, Des Moines.
W. H. Imes, Pres., Automobile Trade Ass'n of Kansas, Topeka.
Prince Wells, Pres., Louisville Automobile Dealers' Ass'n, Louisville.
H. B. Chandler, Secy., Portland Automobile Dealers' Ass'n, Portland, Maine.
Chester I. Campbell, Secy., Boston Commercial Motor Vehicle Ass'n, Boston.
H. E. Pence, Pres., Minneapolis Automobile Trade Ass'n, Minneapolis.
E. E. Peake, Secy. and Treas., Kansas City Motor Car Dealers' Ass'n, Kansas City.
E. V. Stratton, Hudson Motor Car Co., Albany.
F. W. A. Vesper, Vesper-Buick Co., St. Louis.
Frederick H. Caley, Hollenden Hotel, Cleveland.
A. L. Boorse, Pres., Birmingham Automobile & Accessory Ass'n, Birmingham.
J. Walter Drake, Hupp Motor Car Co., Detroit.
M. S. Bulkley, Autocar Sales & Service Co., San Francisco.
H. E. Mitchell, San Francisco.
W. S. Gilbreath, Detroit Automobile Club, Detroit.

New York Exports Decline

Steady Drop in Proportion of Shipments from Metropolis to Total Amount

NEW YORK, June 6—The proportion of automobiles, trucks and parts shipped from the port of New York was only 24 per cent of the total automotive exports from the United States in April, as compared with 46 per cent in March, 61 per cent in February and 71 per cent in January.

Automobiles, trucks and parts shipped from New York in April totalled $2,396,448, as against $3,779,204 in March, despite the fact that the March exports as a whole were less than the April shipments.

A small proportion of the cars shipped to South America are sent via New York. Argentina received $174,674 worth, and of this amount only $13,842 went through this port. On the other hand, practically all the cars received by Chile came from here.

Of the 418 cars sent to Australia, 113 went through other ports. Only one of the Dutch East Indies quota of 65, and 205 of New Zealand's 235 cars were shipped from this port.

The total value of passenger cars shipped from New York was $985,590; that of trucks $750,710, and parts $660,143. The proportion of parts shipped is increasing steadily, not only in relation to exports from New York but also from all of the United States.

The largest individual shipment from New York was a total of 93 motor trucks sent to France. These were valued at $377,564.

Automobile, Truck and Parts Exports from New York for April

	Passenger Cars		Commercial		Parts
	No.	Value	No.	Value	Value
Argentina	10	$13,842	...	....	$12,720
Australia	305	259,463	4	$4,393	33,246
Barbados	...	....	...	....	1,377
Bolivia	1	1,171	...	....	47
Brazil	17	18,987	1	600	7,050
British East Africa	3	3,208	...	....	78
British East Indies	...	....	...	....	240
British Guiana	1	440	...	....	758
British Honduras	...	....	...	....	136
British India	...	....	...	....	19,247
British Oceana	6	3,600	...	....	....
British South Africa	18	18,032	...	....	9,586
British West Africa	...	....	...	....	500
British West Indies	5	3,599	1	600	871
Costa Rica	40	19,600	...	....	118
Chile	39	71,050	3	3,472	22,086
Cuba	41	45,325	17	39,049	85,346
Colombia	5	14,495	...	....	4,610
Danish East Indies	...	....	...	....	6,932
Danish West Indies	...	....	...	....	863
Denmark	2	4,100	...	....	....
Dutch East Indies	1	300	...	....	356
Ecuador	2	1,800	...	....	615
England	1	2,600	56	196,392	178,177
France	93	....	93	377,564	152,122
French Africa	2	880	1	600	250
French East Indies	...	....	...	....	41
French West Indies	13	11,338	...	....	6,540
Gibraltar	...	....	27	58,325	....
Guatemala	...	....	...	....	195
Hayti	6	3,146	4	4,582	1,364
Honduras	12	9,027	...	....	692
Iceland	11	1,272	...	....	....
Italy	1	2,000	45	22,200	....
Jamaica	23	12,241	1	600	4,910
Mexico	20	21,471	10	17,673	3,405
Newfoundland	1	1,232	1	3,250	111
New Zealand	205	177,658	9	18,894	40,823
Nicaragua	1	550	...	....	141
Panama	3	3,034	3	3,866	2,184
Peru	48	55,111	3	4,205	7,309
Philippine Islands	112	51,620	...	....	3,238
Port Africa	...	....	...	....	330
Portugal	...	....	...	....	2,782
Salvador	3	3,332	...	....	478
San Domingo	25	15,437	6	3,600	3,396
Siam	...	....	...	....	96
Spain	42	70,007	5	4,950	17,925
Straits Settlement	...	....	3	3,681	8,909
Trinidad	29	21,838	1	1,634	3,175
Uruguay	80	30,000	...	....	7,851
Venezuela	15	12,459	2	1,200	6,927
Total	1,139	$985,590	286	$750,710	$660,142

Fordson Equipment Being Developed

CHICAGO, June 4—A grain binder, a small threshing machine, a wood saw outfit and a power feed grinder, for exclusive use with the Fordson tractor, are being developed at the present time at the Ford tractor factory at Dearborn, Mich. It is understood that a silo filler and a line of equipment along the lines of grain seeders and drills likewise will be undertaken.

Maximum Aluminum Price 33 Cents

WASHINGTON, May 31—The new maximum base price of aluminum from June 1, 1918, to Sept. 1, 1918, has been set at 33 cents per pound f.o.b. the United States producing plants, for 50 tons or over, of ingot of 98 to 99 per cent. This and the following prices have been made by the War Industries Board and approved by the President, following co-operative investigations between the board and the Federal Trade Commission:

Differentials for sheet, rod and wire will be increased by approximately 12½ per cent; differentials for quantity and grade and differentials for alloys will remain as heretofore, i. e., those approved by the price-fixing committee of the War Industries Board on March 3, 1918. Copies of the new list of differentials may be obtained upon application to the nonferrous metals section of the War Industries Board.

The new prices will be effective on deliveries made during the period from June 1, 1918, to September 1, 1918, on contracts made during said period; and furthermore the new prices will be effective on deliveries made during said period on existing contracts which specify that the price shall be that in force at the time of delivery. Deliveries made during the period June 1, 1918, to September 1, 1918, on other contracts shall be at the price stated in such contracts, except that on existing "direct and indirect Government contracts" containing a provision that refund is to be made of the difference between the price stated in the contract and the "Government fixed price, if, as, and when made," such difference shall be refunded on deliveries made during the period from June 1, 1918, to September 1, 1918, on presentation of proper proof that the purchasing Government gets the benefit of the refund.

The conditions are as formerly: First, the producers of aluminum will not reduce the wages now being paid; second, aluminum shall be sold to the United States Government, to the public in the United States, and to the allied Governments at the same maximum base price; third, they will take the necessary measures, under the direction of the War Industries Board, for the distribution of aluminum to prevent it from falling into the hands of speculators who might increase the price to the public; and, fourth, they will pledge themselves to exert every effort necessary to keep up the production of aluminum so as to insure an adequate supply so long as the war lasts.

Prohibit Magnetos for 5 Years

British War Committee Recommends Action to Protect New Industry

LONDON, ENGLAND, May 6—Importation of foreign magnetos into Great Britain is to be prohibited for an initial period of 5 years after the war, except as such may be imported under license, according to the recommendations of the Committee on Commercial and Industrial Policy After the War, which has had this matter under consideration for some time. The provision permitting importation under license is intended to insure maintenance of quality and necessary output on the part of home manufacturers.

If any license is granted, then the German machines admitted would have to pay a duty of 33 1/3 per cent.

Further, the committee considers that the British industry having been established under war conditions, when prices were high and demands abnormal, will require time to adapt itself to normal commercial purposes and cannot be expected at first to compete in price with American magnetos.

Consequently, a duty equivalent to 33 1/3 per cent ad valorem is recommended to be imposed for a period of 5 years on magnetos and other ignition apparatus imported from any source. At the end of the 5 years it is suggested that there should be a progressive reduction of the duty, and from the first the maintenance of the duty is contingent upon the home industry not taking any unfair advantage of the assistance given to it.

A further recommendation is that all British Government departments should purchase only British-made magnetos and ignition apparatus and should specify the same for all vehicles in respect of which subsidies are granted. This policy is approved by the Admiralty and the Ministry of Munitions, but the War Office objects to it on the grounds that the Government must not be debarred from obtaining the most efficient apparatus from any source whatever. It is, however, proposed to apply the principle experimentally for a period of three years, subject to the application of a strict standard of excellence and the maintenance of reasonable prices. From these proposals, aiming to meet all the requirements of a very special case, we are led to the conclusion that any protection by tariffs that may ultimately be given to the British motor vehicle industry will be based upon a materially more modest scale than the terms mentioned above.

As is generally known, prior to the war approximately 90 per cent of the magnetos used in England came from the Bosch Co. in Germany. The total import up to that time is estimated at 300,000 machines. British production of magnetos was then insignificant. The report states that, with the assistance of Sheffield firms as regards magnetic steels, a number of British concerns have now succeeded in producing magnetos of a very high quality. The abnormal conditions under which the industry was established, coupled with the inflated cost of plant, would, however, make it incapable of competing at an early date with the German monopolists if free access to the British markets were permitted to the latter. The English branch of the Bosch company has now passed into other hands and the premises are those of the British Lighting & Ignition Co., financed by Vickers, Limited.

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Gages to Be Key Industry

LONDON, ENGLAND, May 6—Limit and screw gages have been classified as constituting a key industry by the Committee on Commercial and Industrial Policy After the War, which has had the task of selecting what industries must be so classified.

British engineers have been largely dependent for these on the United States, and the British demand was not so great as it should have been owing to a lack of realization of the importance of standardizing. No special encouragement is prepared for this industry other than the general encouragement of the engineering trades to standardize and specialize to a greater extent, but it is proposed that the government should itself maintain an adequate supply of gages and measuring instruments, to be purchased from British firms, and shall thus insure plentiful stocks of the particular types required for war work.

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Italian Car Exports Tripled

TURIN, ITALY, June 3—The export of Italian motor vehicles has practically tripled in the last 6 years, and the estimated value of automobile exports for 1917 was more than $20,000,000, according to figures compiled by the Italian Ministry of Finance. Consular reports show that the Italian automobile industry centers in Turin, the seven best known Italian cars being made there.

All Italian motor factories are working for the government at present. The number of touring cars manufactured has decreased, and in proportion the number of motor trucks increased. A majority of the latter are of 1-, 1½- and 3-ton capacity.

The following table shows the exports of cars and trucks from Italy:

Year	Trucks	Cars	Total
1911	$447,215	$5,825,577	$6,222,792
1912	585,916	7,157,236	7,743,152
1913	461,092	6,375,086	6,836,178
1914	807,465	7,326,934	8,134,399
1915	7,166,080	5,510,115	12,676,195
1916	10,932,620	1,903,030	12,835,650
1917*	9,034,225	303,183	9,337,408

*First 4 months.

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Abbott Sale Ends June 1

DETROIT, May 31—The sale of the stock of the bankrupt Abbott Motor Co. will end to-morrow. Miscellaneous parts and accessories are included in the sale.

British Industries Classified

Key Industries Must Be Maintained—Committee Has Recommendations

LONDON, ENGLAND, May 6—A new division of industries, so far as their relationship to war is concerned, has been recommended in England by the Committee on Commercial and Industrial Policy After the War. The motor industry in England came under the survey of this committee and evidence was taken from the manufacturers as well as the representative organizations of the industry. This committee divides industries into three classifications as follows:

1—Key or pivotal industries, upon the maintenance of which other and greater industries are dependent. The magneto industry is named as one of these.

2—Industries which are essential to the future safety and economic strength of the nation. Among these motor engineering and the manufacture of rubber tires are mentioned.

3—Luxury industries, which are not, by their character, deserving of special encouragement, but which, like the others, ought to be protected from dumping and from the competition of sweated goods.

The proposal is that key industries must be developed at all cost and regardless of ordinary economic principles. This might be done either by loans, subsidies, tariff or Government contracts, or a combination of any or all of these. In the last resource, the Government would itself undertake manufacture and in any case it will exercise supervision. Thus there is no likelihood of the British magneto industry being allowed to decay, and presumably equal assistance will be given to the industry which produces the dynamos and batteries that form the essentials of ignition systems in which the magneto does not figure.

As regards the second group, namely, essential industries, it is proposed that a strong board should be established to examine into all applications for State assistance. This board will first inquire whether the troubles experienced by these industries could not be remedied by improved internal organization. If the fault does not appear to lie here, then the board would recommend State assistance, always bearing in mind the interests of the consumer and of labor. This assistance might take the form of protective duties, or might be given in the shape of bounties on production, preferential treatment in respect of official contracts, or financial assistance by the State, or all these plans might be applied simultaneously. So far as one can tell, the British motor industry would be likely to receive some consideration from this board, since the report refers to the fact that the difficulties which the industry experiences are largely due to ill-advised legislation, as distinct from defective management and organization.

A minority of the committee favored a

general tariff on all manufactured goods, while a few members were opposed to the use of tariffs of any kind as a means of assisting industry. The majority report was, however, so strongly supported that it is only reasonable to suppose that it will be almost wholly adopted as the policy of the British Government.

The Committee on Commercial and Industrial Policy After the War was established by the Prime Minister in July, 1916, under the Chairmanship of Lord Balfour of Burleigh, and is extremely representative. It has enlisted the assistance of a number of subsidiary committees, each of which has taken a great volume of evidence from some specific industry. The committee was perhaps more than usually interested in this particular industry, because returns show that in 1913 about one-fifth of the total engineering imports entering Great Britain from the United States consisted of motor cars and parts. The same items accounted for two-thirds of the engineering imports from France, and more than half of those from Belgium. One of the recommendations of the Engineering Trades Committee was that the British Government, as well as municipalities and corporations, should, subject to the necessary safeguards, purchase only goods of British origin. Such a measure would, of course, be beneficial to the British motor industry, as against its competitors so far as home markets are concerned, and conceivably the oversea Dominions might adopt the same course. Altogether, the Engineering Trades Committee was impressed by a somewhat general lack of standardization and specialization, not particularly among motor manufacturers, but in the industry as a whole.

The Central Committee, to which the Engineering Trades and other committees reported, has made recommendations, which are approved by the majority of its members, favoring the introduction of a limited system of tariffs on manufactured goods.

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Coal Output at Highest Point

WASHINGTON, June 3—The coal and coke production of the country for the week ended May 2 was 76.6 per cent, the highest point attained this year. Losses in production were due chiefly to car shortage and also to labor shortage, strikes, mine disability and no market. The Fuel Administration estimates a need for 79,000,000 tons of anthracite coal for the year, necessitating an increase in production of 2,000,000 tons. Production in 1917 was 89,720,802, but of this only 77,133,305 tons were shipped, the balance being required at and about the mines.

Bituminous coal production for the week ended May 18 was 11,782,000 tons as compared with 11,825,000 tons for the week previous. Anthracite shipments for the same week were reported as 41,011 cars, an increase of 6 per cent over the previous week. Beehive coke production for the week was 678,000 net tons, an increase of 10,000 tons over the week preceding.

Higher Prices Set for Manganese

New Schedule Approved by War Industries Board and Iron and Steel Institute

WASHINGTON, June 3—Higher prices for manganese ores produced in the United States have been set, and were placed in effect at midnight, May 28. The prices have the approval of the War Industries Board and were agreed to by the American Iron & Steel Institute. The effectiveness of the schedule is definite, no time limit having been arranged.

The prices of domestic metallurgical manganese ore vary from $0.86 to $1.30 per unit, on the basis of delivery f.o.b. cars South Chicago, Ill. The prices are net to the producer.

The order follows:

The following schedule gives domestic metallurgical manganese ore prices per unit of metallic manganese per ton of 2,240 pounds for manganese ore produced and shipped from all points in the United States west of South Chicago, Ill. This schedule does not include chemical ores as used for dry batteries, etc. The prices are on the basis of delivery f.o.b. cars South Chicago, and are on the basis of all-rail shipments. When shipped to other destination than Chicago, the freight rate per gross ton from shipping point to South Chicago, Ill., is to be deducted to give the price f.o.b. shipping point.

Schedule for metallic manganese ore containing when dried at 212° F.:

Per cent.	Per unit.
35 to 35.99 inclusive	$0.86
36 to 36.99 inclusive	.90
37 to 37.99 inclusive	.94
38 to 38.99 inclusive	.98
39 to 39.99 inclusive	1.00
40 to 40.99 inclusive	1.02
41 to 41.99 inclusive	1.04
42 to 42.99 inclusive	1.06
43 to 43.99 inclusive	1.08
44 to 44.99 inclusive	1.10
45 to 45.99 inclusive	1.12
46 to 46.99 inclusive	1.14
47 to 47.99 inclusive	1.16
48 to 48.99 inclusive	1.18
49 to 49.99 inclusive	1.20
50 to 50.99 inclusive	1.22
51 to 51.99 inclusive	1.24
52 to 52.99 inclusive	1.26
53 to 53.99 inclusive	1.28
54 and over	1.30

For manganese ore produced in the United States and shipped from points in the United States east of South Chicago, 15 cents per unit of metallic manganese per ton shall be added to above unit prices.

Above prices are based on ore containing not more than 8 per cent silica and not more than 0.25 per cent phosphorus, and are subject to:

Silica premiums and penalties.—For each 1 per cent of silica under 8 per cent down to and including 5 per cent premium at rate of 50 cents per ton. Below 5 per cent silica, premium at rate of $1 per ton for each 1 per cent.

For each 1 per cent in excess of 8 per cent and up to and including 15 per cent silica there shall be a penalty of 50 cents per ton: for each 1 per cent in excess of 15 per cent and up to and including 20 per cent silica there shall be a penalty of 75 cents per ton.

For ore containing in excess of 20 per cent silica a limited tonnage can be used, but for each 1 per cent of silica in excess of 20 per cent and up to and including 25 per cent silica there shall be a penalty of $1 per ton.

Ore containing over 25 per cent silica subject to acceptance or refusal at buyer's option, but if accepted shall be paid for at the above schedule with the penalty of $1 per ton for each extra unit of silica.

All premiums and penalties figured to fractions.

Phosphorus penalty.—For each .01 per cent in excess of .25 per cent phosphorus there shall be a penalty against unit price paid for manganese of one-half cent per unit, figured to fractions.

In view of existing conditions, and for the purpose of stimulating production of domestic manganese ores, there will be no penalty for phosphorus so long as the ore shipped can be used to advantage by the buyer. The buyer reserves the right to penalize excess phosphorus as above by giving 60 days' notice to the shipper.

The above prices to be net to the producer: any expenses, such as salary or commission to buyer's agent, to be paid by the buyer.

Settlements to be based on analysis of ore sample dried at 212° F. The percentage of moisture in ore sample as taken to be deducted from the weight.

Payments.—Eighty per cent of the estimated value of the ore (less moisture and freight from shipping point) based on actual railroad-scale weights to be payable against railroad bill lading, with attached certificates of sampling and analysis of an approved independent sampling chemist. Balance on receipt of ore by buyer. Actual railroad-scale weights to govern in final settlement. Cost of sampling and analysis to be equally divided between buyer and seller.

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Campbell May Manage Government Exhibit

WASHINGTON, June 3—Chester I. Campbell, who has managed the Boston automobile shows, has been asked by the Government to take charge of the Allied War Expositions. These will consist chiefly of relics captured by the Allies, and will, according to present plans, open at San Francisco, and move east to Los Angeles, Seattle, Denver, Chicago, Boston, New York and other large cities.

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Higrade Motors Increases Board

BUFFALO, N. Y., June 1—At the annual meeting of the Higrade Motors Co. held on May 28 the membership of the board of directors was increased from 5 to 7. Members were elected as follows: Messrs. Shay, Voorhees, Stone and Ewing, Harbor Springs, Mich.; Messrs. Backus and Coppock, Grand Rapids, and J. Elmer Pratt, Buffalo.

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Permanent Board for Labor Arbitration

DETROIT, May 31—A permanent board was established here to arbitrate labor disputes, when on May 27, ex-President Taft and Frank P. Walsh met to adjust a dispute between the Detroit United Railway and its employees. The committee will be known as a sub-committee of the National War Labor Board.

B Trucks Move Shipping Board Equipment

600 Tons of Office Material Are Hauled from Washington to Philadelphia—Trip with Loading and Unloading Takes Less Than 24 Hours—Return Load Carried

WASHINGTON, June 3—Hauling 600 tons of office files and equipment from Washington to Philadelphia within the last 96 hours, and returning from there with 600 tons of Quartermaster supplies, 140 Class B standardized war trucks are demonstrating the possibilities of both motor truck express and return loads.

Beginning Friday night, the trucks under guidance of the Quartermaster department began the moving of the Shipping Board offices. The board, occupying thirty-four office buildings and employing 3000 workers, is moving to Philadelphia. The need for speed and the lack of time allowance involved by ordinary railroad freight transportation stimulated the board to seek the fastest shipment scheme. It called upon the army for aid with the result that the Class B war trucks operating in four convoys are performing the work.

The first convoy, coming here from Baltimore early Friday, May 31, arrived at the Shipping Board main office building at 5 p. m. It comprised thirty cargo trucks, two oil and gasoline tank trucks, a light Dodge repair car, a Dodge roadster and a Dodge touring car. Loading of the cargo commenced at 5 p. m. and was completed at 11 p. m. when the trucks moved out of the capital toward Philadelphia. They arrived at Baltimore at 3 a. m., took on spare parts, and left at 4.45, losing time in finding the right road out of the city. At 8 p. m. they reached Philadelphia, discharged the cargo and parked the trucks before midnight, making the complete job of loading in Washington, covering the entire journey and unloading at the destination, in less than 24 hours, work involving 4 to 8 days by the fastest railroad freight. Much time was lost by the first convoy owing to the drivers' unfamiliarity with the roads. Later convoys are cutting the time several hours. The running time for 167 miles was 15¾ hr., an average of 10 m.p.h., with a gross average of 7.6 m.p.h.

After resting at Philadelphia, the convoy took on a load of 100 tons of Army supplies for Camp Holabird, Baltimore, and started its return trip early to-day. Since it left Washington, three other convoys have loaded and moved more of the office equipment. The second convoy left here June 1 at 8 a. m. The third left June 1 at 1 p. m. and the fourth at 8 a. m. to-day. The second and third convoys have already reached Philadelphia, discharged their cargoes, taken on Army supplies and started the return trips.

This plan of carrying the furniture to Philadelphia and returning with Quartermaster supplies will be continued for about 10 days, by which time it is expected that equipment belonging to more than 500 offices in Washington will have been transferred to Philadelphia, while more than 2500 tons of Army supplies will have been hauled from Philadelphia to Baltimore.

The company of 120 trucks and 300 men is under the command of Captain Burt T. Jones, stationed at Camp Holabird.

The return loads plan, together with the hauling from Washington, was developed under the supervision of Lieutenant-Colonel W. D. Uhler of the Motor Transfer service, who was assisted by Roy D. Chapin, chairman of the highway transfer committee.

The trucks carry their mess with them and stop on the road for meals, the men being served quickly at the mess wagon to avoid loss of time. The gasoline tank wagons operate whenever necessary to maintain the supply of both gasoline and oil, and also save the time which would be lost in stopping for gasoline at cities along the route.

The trips are being made both by night and day. The truck trains leave Washington as soon as loaded and do not stop until they reach their destination. Police and city officials throughout the route have been instructed by the government to extend all aid possible, and are giving the trucks the right of way through all city traffic in addition to sending motorcycle police to act as pilots.

The log of the trip of the first convoy follows:

Leave	Washington, May 31	11.00 p.m.
Arrive	Baltimore, June 1	3.00 a.m.
Leave	Baltimore	4.45 a.m.
Arrive	Newark, Del.	2.10 p.m.
Leave	Newark, Del.	2.40 p.m.
Arrive	Wilmington	3.40 p.m.
Leave	Wilmington	5.15 p.m.
Arrive	Philadelphia	8.00 p.m.

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Government Urges Trucks for Farmers

WASHINGTON, June 3—Farmers are being urged by the Employment Service of the Department of Labor to assist the development of rural motor transporta-

Upper: When the trucks lined up before the U. S. Shipping Board building in Washington, some of the office equipment was already on the sidewalk awaiting them

Lower left: Stopping for a short rest en route

Lower right: The filing cabinets, waste baskets and other equipment filled each truck from front to rear

tion in order to release as much labor as possible. Louis F. Post, assistant secretary of the Department of Labor in a letter to the Highways Transport Committee promised the co-operation of the department in the plans of the committee for the institution and development of the rural motor express. He asserted that a 5-ton truck with a single man can deliver more than 3 wagons with 3 drivers and cover 3 times the mileage.

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Plan National Tractor Demonstration

CHICAGO, June 5—One national tractor demonstration, to be held at Salina or Wichita, Kan., during the month of July, wil' be the only one the Tractor Division, National Implement and Vehicle Association will fficially authorize for this year. This was determined at a meeting of the Tractor Division held here yesterday.

Official sanction was extended to territorial demonstrations as follows: Minot, N. D., June 18, 19, 20; Brandon, Man., July 23, 24, 25; Los Angeles, Cal., at a date to be set later.

A composite test of fuel consumption will be made at the national demonstration to determine the approximate cost of tractor plowing. This test will not be competitive in any sense. Manufacturers will be permitted to use whatever fuel they choose. Tests also will be made to determine the horsepower pull under the various conditions.

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No Steel for License Tags

WASHINGTON, June 6—Automobile license tags must be made of material other than steel this year, according to an announcement made by Bernard M. Baruch, head of the War Industries Board. Zinc has been suggested as an available substitute, but this costs three times as much as steel. Five tons of the latter substance are needed to make the required number of tags. The practicability of requiring automobile owners to bring their old tags in for restamping was discussed at a conference between Mr. Baruch, Assistant Secretary of State Taft and Senaor Calder, on Monday. No action was taken.

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Firestone Separates Rim Division

AKRON, OHIO, June 4—The Firestone Steel Products Co. has been incorporated to manufacture demountable rims, and has absorbed the interests of the Firestone rim plant completely. The officers are the same as those of the Firestone Tire & Rubber Co., with the exception of J. G. Swain, who is vice-president and factory manager of the new organization. The officers are: President, H. S. Firestone; vice-presidents, R. J. Firestone and A. C. Miller; vice-president and factory manager, J. G. Swain; secretary, S. G. Carkhuff, and treasurer, J. G. Robertson. In addition to the further development of the standard Firestone rim, the company will manufacture other metal accessories for automobile wheels and tires.

Ralph De Palma Wins Harkness Race

Drives His Packard 100 Miles In 58:21—Milton Finishes Second and Oldfield Third

HARKNESS TROPHY RACE, 100 MILES

Driver and Car	Time	Handicap
Ralph De Palma (Packard)	58:21	1:01
Tom Milton (Duesenberg)	58:31	2:05
Barney Oldfield (Gld. Sub.)	59:20 1/5	2:10
Ed Hearne (Frontenac)	1:00:52	2:12
Denny Hickey (Hudson)	1:01:40 4/5	3:10
Omar Toft (Miller)	1:03:23	2:35
Louis Chevrolet (Frontenac)	1:03:35	Scratch
I. P. Fetterman (Peerless)	1:04:40	4:00

FUTURITY HANDICAP

First Heat

Driver and Car	Time
Ralph Mulford (Frontenac)	6:10 2/5
Tom Milton (Duesenberg)	.....
Jack Le Cain (De Lage)	.....

Second Heat

Dario Resta (Resta)	6:07
Ed Hearne (Duesenberg)	.....
Louis Chevrolet (Frontenac)	.....

Final Heat

Louis Chevrolet (Frontenac)	5:57 2/5
Ed Hearne (Duesenberg)	.....
Dario Resta (Resta)	.....
Tom Milton (Duesenberg)	.....

SHEEPSHEAD BAY SPEEDWAY, June 1—Ralph De Palma, driving a Packard, won the Harkness Trophy race to-day, finishing the 100 miles in 58:21, at the rate of a little better than 102 miles an hour. Tom Milton, at the wheel of a Duesenberg, came in second, just 10 seconds behind De Palma, and Barney Oldfield, in his Golden Submarine, finished third, 49 sec. after Milton. Resta, driving a car of his own design, was eliminated in the fifty-fourth mile with a broken piston, and Louis Chevrolet, who drove a Frontenac, had so much tire trouble that he was not a serious contender and finished seventh. Ralph Mulford went out at 68 miles, when he was in third place, with a broken oil feed connection.

Due to an error in the scoring, it was announced that Tom Milton had won, but a later check of the score sheets revealed that De Palma had lapped him after going a little more than half the distance, which put Milton in second place and changed the positions of all the other finishers.

One of the largest crowds that has visited the speedway saw the races. The grandstand was packed, and it is estimated that between 40,000 and 45,000 persons were on hand.

In the short sprints Louis Chevrolet accounted for the final heat of the Futurity Handicap at 10 miles, turning off the distance in 5:57 2/5, which was considerably faster than either of the two previous heats, which were taken by Mulford and Resta.

De Palma's time in the Harkness race is quite a bit slower than Chevrolet's time last year, when he won the event in 54:20.98, which is at the rate of 110 m.p.h. De Palma was not forced to extend himself greatly after Chevrolet and Resta had quit, and this probably accounts for the slower pace.

The real fight was between De Palma and Tommy Milton. De Palma started with a handicap of 61 sec., whereas Milton had 2 min. and 5 sec., giving him a lead of 1 min. and 4 sec., which is practically a lap. With Chevrolet and Resta out of the way, De Palma went out after Milton. He was driving carefully and consistently, doing laps regularly as clockwork at 1:05, which is practically 110 m.p.h. But it was not until the 28th lap, or just about at the half-way post, that De Palma was able to get the Duesenberg pilot.

It was manifest that De Palma's Packard was quite a bit faster than Milton's Duesenberg, and immediately after he had passed Milton, De Palma slackened his pace and Milton hung within a dozen feet of his axle all through the rest of the race to within four laps of the finish. Then De Palma commenced increasing his lead, and at the finish line had opened up a gap of nearly a quarter of a lap between himself and Milton.

This is the first time that the Harkness race has been run on a handicap basis, and this made it doubly hard for the scorers. Until the race was more than half over the cars were stretched around the track in a procession. There were fifteen starters.

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Canadian Plant for New Overland Car

TORONTO, June 3—Plans for a Canadian factory to build the new 100-in. wheelbase car recently designed by the Willys-Overland Co. were discussed at a conference held here last Thursday between capitalists of Canada and the United States. Among those attending the conference were John N. Willys, president of the Overland company; J. T. Kepperley, vice-president and general manager of the Curtiss Aeroplane & Motors Corp.; C. B. Wilson, president of the Wilson Foundry & Machine Co., and J. Allan Smith, president and general manager of the United States Light & Heat Corp. According to the plans arranged, the factory will be built near Toronto, and work in harmony with a similar organization in the United States. The new car will have a self-starting and lighting and an entirely new spring suspension system.

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No Licenses for Truck Makers

WASHINGTON, June 3—A definite ruling by the Department of Agriculture states that motor tractor companies manufacturing tractors for farm use will be required to take out a license under the recent Presidential proclamation. Motor truck and trailer manufacturers will not for the immediate present be expected to take out licenses. These rulings definitely confirm the report published in the last issue of AUTOMOTIVE INDUSTRIES.

General Motors Buys St. Louis Factory Site

ST. LOUIS, June 4—The General Motors Corp. has bought a 105-acre tract here for a body factory and assembling plant. The plant, which will cover 40 acres, will be erected at once.

The announcement in regard to the new plant followed an announcement that Russell E. Gardener, president of the Chevrolet Motor Co. of St. Louis, had sold his holdings to the Chevrolet Motor Co. of New York for $1,000,000. Mr. Gardener said that W. C. Durant, president of the General Motors Co., had been in St. Louis on May 27 to complete the deal, and that a manager representing the purchasing company would take charge of the plant on Aug. 1.

The Chevrolet Motor Co. of St. Louis was formerly the Banner Buggy Co., which was founded by Gardener. It has been the body factory for the western assembly plants for Chevrolet cars, and employs more than 100 persons.

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Shaler to Increase Plant

WAUPUN, WIS., June 4—The C. A. Shaler Co. is planning a factory addition and also an addition to its office building which will double the floor space.

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Work for Red Cross

MILWAUKEE, June 4—Instead of taking the usual holiday, employees of the Milwaukee Auto Engine & Supply Co. worked all day May 30 and donated their wages for the day to the Red Cross. This amounted to more than $800.

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Milwaukee Pattern to Add

MILWAUKEE, June 4—The Milwaukee Pattern & Mfg. Co. will build a 2-story shop addition to its plant.

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National Brake Adds Foundry

MILWAUKEE, June 4—The National Brake & Electric Co. is erecting a new gray iron foundry, core-room and auxiliary buildings at its main plant here.

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Falls Motors Drops Woodworking Tools

SHEBOYGAN FALLS, WIS., June 4—The Falls Motors Corp. has discontinued the manufacture of woodworking machinery. The unfilled orders of this department will be handled by the Jenkins Machine Co., Sheboygan, Wis. The Jenkins company will also take over all manufacturing rights.

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New Bohn Foundry Making Headway

DETROIT, June 3—The factory being built by the newly organized Charles B. Bohn Foundry Co. will have a capacity of 40,000 to 50,000 lbs. of castings daily. The company is capitalized at $300,000 and the officers are: Charles B. Bohn, president; W. N. Krug, vice-president; H. W. Holt, secretary and treasurer; O. F. Flumerfelt, manager. President Bohn was one of the incorporators of the old Central Brass Foundry, Cleveland. In 1905 he came to Detroit and organized the Allyne Brass Foundry Co. of Michigan and later was one of the organizers of the Allyne Brass Foundry Co. of New York. A company was also started in Ohio, and subsequently these three concerns were amalgamated under the style Aluminum Castings Co., of which Bohn became general manager.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

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General Motors to Build Foundry

SAGINAW, MICH., June 3—The General Motors Corp. is planning to build a foundry in Saginaw that will employ about 1000 men at the start. It will be built north of the old Marquette plant, and will occupy buildings 600 x 1400 ft. This plant will supply part of the requirements of all the subsidiaries of the General Motors Corp.

—

Cutler-Hammer Building Foundry

MILWAUKEE, June 4—The Cutler-Hammer Mfg. Co., which is devoting practically its entire capacity to the manufacture of electric controlling devices for the United States Navy, is building a combination foundry for castings. The company has been unable to obtain sufficient castings through ordinary channels.

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More Liberty Bond Subscriptions Reported

PHILADELPHIA, May 31—The Merchant & Evans Co. subscribed for $30,000 worth of Liberty bonds, the employees taking an additional amount of $26,000. The company underwrote the entire amount.

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Dividends Declared

The Pennsylvania Rubber Co. has declared regular quarterly dividends of 1¾ per cent on preferred and 1½ per cent on common stock, payable June 29 to stock of record June 15.

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The Moline Plow Co. has declared a quarterly dividend of 1½ per cent on preferred stock, payable June 1 to stock of record May 19.

—

The Ajax Rubber Co. has declared the regular quarterly dividend of 2 per cent payable June 15 to holders of record May 31.

American Engine Making New Model Farm Tractor

CHARLES CITY, IOWA, June 4—The American Engine & Tractor Co. of this city, which manufactures kerosene engines and farm tractors in a modern daylight foundry and machine shop, has brought out its new model, American 15-30 farm tractor. A dynamometer test, recently made by experts of the Hyatt Roller Bearing Co., showed that the tractor, without any preliminary running in, was capable of developing a drawbar horsepower of more than 17 ft., and for short distances, up to about 200 ft., as much as 20 hp.

The new American 15-30 farm tractor is a 4-cylinder machine, and is said to be capable of pulling 3 or 4 plows and plowing from 10 to 12 acres a day, at a speed of 2 1/3 m.p.h. It is equipped with a transmission giving 2 forward speeds and one reverse. The complete weight of the tractor is about 5000 lbs. It has an overall length of 10 ft. 6 in., an overall width of 6 ft. 3 in., and an overall height of 4 ft. 10 in., and its turning radius is about 10 ft.

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Ramsey-Alton to Make Truck Parts

PORTLAND, MICH., May 31—The Ramsey-Alton Mfg. Co. has received a government contract for parts for army trucks, including tongues, axles, axle beds and brake blocks. These will be shipped directly to France for assembly. It is probable that the upholstery department will be called upon to make leggings.

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Auto Parts Now Badger Mfg. Corp.

MILWAUKEE, June 3—The Auto Parts Mfg. Co., manufacturer of Badger accessories, has changed its style to the Badger Mfg. Corp. Walter H. Schwab is president and general manager of the company, and Edward J. Cunningham secretary and treasurer.

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Maynard Electric Building New Plant

MILWAUKEE, June 4—The Maynard Electric Steel Casting Co. is building a new electric steel foundry. Its present plant has been purchased by the Globe Gray Iron Foundry Co.

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Kearns Making 1½-Ton Chassis

BEAVERTOWN, PA., May 31—The Kearns Motors Co. is manufacturing a 1½-ton chassis, which will be ready for distribution about Aug. 1. It will have a Herschell-Spillman engine and Russel internal drive rear axles. The estimated price of the chassis with driver's seat is $1,800.

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Power Truck Leases Factory

DETROIT, June 4—The Power Truck & Tractor Co., which has recently incorporated, has taken a 5-year lease on a factory building here. This is located at the intersection of Beard Avenue and the Michigan Central Railroad.

Potter Made President of American Motor Truck

Colonel Joseph D. Potter has been elected president of the American Motor Truck Co., Newark, Ohio. He was formerly associated with the Kilbourn & Jacobs Mfg. Co., Columbus.

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C. Tom Barbour has been appointed purchasing agent for the Bearings Service Co., Detroit, succeeding K. H. MacQueen, who has joined the army.

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A. D. Kelley, assistant general manager of the Signal Motor Truck Co., Detroit, and formerly connected with the Chalmers Motor Co. and Dodge Brothers, has resigned to do government work. His duties will not take him away from Detroit.

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F. W. Henderson has been elected president of the Signal Motor Truck Co., Detroit, to succeed A. C. Burch, who resigned.

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C. T. Chenevert, formerly vice-president of the Denby Motor Truck Co., Detroit, has been commissioned a senior lieutenant in the Bureau of Aviation Operation, to supervise navy trucks in France.

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N. E. Wahlberg has been appointed a major in the Quartermaster's Corps of the United States Army. He was formerly chief engineer of the Nash Motors Co., Kenosha, Wis., and prior to that chief engineer of the Oakland Motor Car Co., Pontiac, Mich.

—

Charles S. Shuman, for many years connected with the Klaxon Horn organization, and recently manager of the automobile department of the Standard Metal Mfg. Co., Newark, N. J., has resigned the latter position to become sales manager of the Vacuum Muffler Corp., New York.

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Richard Taylor has been appointed sales manager of the Mayo Radiator Division of the Marlin-Rockwell Corp., New Haven, Conn.

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H. M. Prewett has been appointed district manager of the Willard Storage Battery Co., with headquarters in Detroit. He succeeds S. S. Jenkins, who has been made district manager of manufacturer's sales.

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M. F. Luckenbill, formerly in the truck department of the Packard Motor Car Co., has been appointed sales manager of the Master truck department of the Larson Oldsmobile Co., Philadelphia.

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W. L. Agnew, formerly advertising manager of the Hudson Motor Car Co., Detroit, and later with the Chalmers company in the same capacity, has joined the Moore Motor Co., Columbia, S. C.

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C. M. Waltman, formerly general superintendent of the Weidely Motors Co., has been appointed assistant to the vice-president of the Hupp Motor Car Corp., Detroit.

Men of the Industry

Changes in Personnel and Position

Hagelstine to Manage Detroit Battery Factory

Max Hagelstine has been appointed factory manager of the Detroit Battery Co. and the Disco Electric Mfg. Co., Detroit. For the last 10 years he has been associated with the Studebaker Corp. in the various capacities of plant manager, experimental engineer, assistant chief engineer and head of the Domestic and Foreign Department. Prior to that he was in charge of the experimental work for the Peerless Motor Car Co., the Garford Mfg. Co. and the Rainier Motor Car Co.

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Joseph H. McDuffy, manager of the Chicago branch of the Willys-Overland Co., has resigned. He will be succeeded by A. C. Barber, district representative of the company in the Chicago territory.

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William F. Miller, engineer of the Midland Motor Car & Truck Co., Oklahoma City, has resigned from the company, effective June 15. He has completed the design of the Midland touring car.

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Russ Baldwin, formerly associated with the Champion Ignition Co., Flint, as head of the speedometer department, has resigned. He will announce his new connection shortly.

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Captain W. S. Gilbreath, manager of the Detroit Automobile Club, has been appointed Michigan representative of the Contest Board of the American Automobile Assn., succeeding W. D. Edenburn, who has directed Michigan races sanctioned by the A. A. A. since 1915.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	57	60	..
*J. I. Case T. M. Co., pfd.	81	85	—4
Chalmers Motor Co., com.	4½	5½	—2½
Chalmers Motor Co., pfd.	30	40	..
*Chandler Motor Co.	82	83	+ ½
Chevrolet Motor Co.	126	130	+4
*Fisher Body Corp., com.	30	35	+1
*Fisher Body Corp., pfd.	83	87	..
Fisk Rubber Co., com.	50	55	..
Fisk Rubber Co., 1st pfd.	97	102	—1
Fisk Rubber Co., 2nd pfd.	70	75	..
Firestone Tire & Rubber Co., com.	90	92	—1
Firestone Tire & Rubber Co., pfd.	93	95	..
*General Motors Co., com.	117	119	—6
*General Motors Co., pfd.	81	82	—4½
*B. F. Goodrich Co., com.	42	44	—1
*B. F. Goodrich Co., pfd.	99	100	..
Goodyear Tire & Rubber Co., com.	141	145	—1
Goodyear Tire & Rubber Co., pfd.	95	97	—1
Grant Motor Car Corp.	2½	3¼	— ¼
Hupp Motor Car Corp., com.	2¾	3¼	..
Hupp Motor Car Corp., pfd.	79	85	+2
International Motor Co., com.	25	30	+4
International Motor Co., 1st pfd.	54	58	..
International Motor Co., 2nd pfd.	33	40	+3
*Kelly-Springfield Tire Co., com.	43	46	+ ½
*Kelly-Springfield Tire Co., 1st pfd.	76	87	..
*Lee Rubber & Tire Corp.	16	17	— ½
*Maxwell Motor Co., Inc., com.	25	26	—2½
*Maxwell Motor Co., Inc., 1st pfd.	52	54	—1
*Maxwell Motor Co., Inc., 2nd pfd.	18	19	—2
Miller Rubber Co., com.	100	102	—1
Miller Rubber Co., pfd.	93	95	..
Packard Motor Car Co., com.	107	112	+3
Packard Motor Car Co., pfd.	93	96	+2
Paige-Detroit Motor Car Co.	17	18	..
Peerless Truck & Motor Corp.	13	17	..
Portage Rubber Co., com.	102	105	..
Reo Motor Car Co.	13	15	..
*Saxon Motor Car Corp.	7	9	+1
Standard Motor Construction Co.	12	14	+1
*Stewart-Warner Speed. Corp.	54	55	—2½
*Studebaker Corp., com.	40	41	—1
*Studebaker Corp., pfd.	75	95	—1
Swinehart Tire & Rubber Co.	38	42	+2
United Motors Corp.	25	27	+2
*U. S. Rubber Co., com.	56	57½	..
U. S. Rubber Co., pfd.	102	103	—2½
*White Motor Co.	40	42	+ ½
*Willys-Overland Co., com.	18	19	—1
*Willys-Overland Co., pfd.	79	82	..

*At close June 1. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS.

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	7¾	..
Bower Roller Bearing Co.	18¾	19¼	..
Chevrolet Motor Co.	..	..	..
Commerce Motor Car Co.	10⅜	11½	+ ⅛
Continental Motor Car Co., com.	5⅜	5⅝	— ⅛
Continental Motor Co., pfd.	92¾	..	+ ¾
Edmunds & Jones, com.	14	17	..
Edmunds & Jones, pfd.	80	90	..
Ford Motor Co. of Canada	..	190	..
Hall Lamp Co.	..	14	..
Michigan Stamping Co., com.	..	14	..
Motor Products	..	..	..
Packard Motor Car Co., com.	108	..	..
Packard Motor Car Co., pfd.	92	..	—2
Paige-Detroit Motor Car Co.	..	..	..
Prudden Wheel Co.	11¾	..	..
Reo Motor Car Co.	13½	13¾	— ⅞

INACTIVE STOCKS.

Atlas Drop Forge	..	26	..
Kelsey Wheel Co.	90	92	..

85 New Contracts for B Truck Parts

Quartermaster Corps Awards Are Distributed Among 68 Companies

WASHINGTON, May 31—Following are the 85 awards made by the Quartermaster Department to parts makers, for the parts of the 8000 Class B standardized war trucks which will be assembled by sixteen makers as told last week in AUTOMOTIVE INDUSTRIES. The contracts are distributed among 68 companies:

May 17, 1918

Detroit Pressed Steel Co., Detroit..Frames
Parish & Bingham Co., Cleveland....Frames
A. O. Smith Corp., Milwaukee.....Frames
Savage Arms Corp., Sharon, Pa.....Frames
International Metal Stamping Co., Detroit
Dashes
Bimel Spoke & Auto Wheel Co.,
Portland, Ind.....Wool wheels
Schwarz Wheel Co., Philadelphia
Wood wheels
Standard Wheel Co., Terre Haute, Ind.
Wood wheels
Auto Wheel Co., Lansing Wood wheels
Hayes Motor Truck Wheel Co.,
St. John, Mich.....Wood wheels
Prudden Wheel Co., Lansing..Wood wheels
C. R. Wilson Body Co., Detroit
Seat assemblies
Hayes Mfg. Co., Detroit....Seat assemblies
Hayes Mfg. Co., Detroit.....Fan shrouds
Hayes Mfg. Co., Detroit.....Hoods
Willard Storage Battery Co., Cleveland
Batteries
U. S. Light & Heat Corp., Washington
Batteries
Salisbury Wheel & Axle Co.,
Jamestown, N. Y.....Drawbars
J. W. Murray Mfg. Co., Detroit....Dustpans
Barcey Nicholson Co., Detroit
Wiring assemblies
Gemmer Mfg. Co., Detroit....Steering gears
Warner Gear Co., Muncie.....Steering gears
American Ball Bearing Division,
Standard Parts Co., Cleveland.....Axles
Timken-Detroit Axle Co., Detroit
Bosch Magneto Co., New York....Magnetos
Splitdorf Elec. Co., Newark.....Magnetos
Lamson & Sessions Co., Cleveland
Skid chain anchor screws

May 20, 1918

Dayton Eng. Lab. Co., Dayton
8000 generators
Xardell Bros. Co., Utica
4000 Gasoline feed tanks and 4000 gasoline reserve tanks.
Hinkley Motor Corp., Detroit..1000 motors
Thomas Hinds Co., Malone, N. Y.,
3000 sprag release assemblies
Keeler Brass Co., Grand Rapids
16,000 Hood latch assemblies
Remy Elec. Co., Anderson..8000 distributors
Kales Stamping Co., Detroit
40,000 gasoline line pipe clips
Detroit Lubricator Co., Detroit
8000 clutch release bearing oiling assemblies.
Empire Brass Co., Cleveland
8000 reserve tank drain cocks
Imperial Brass Mfg. Co., Chicago
32,000 flared tube connecting nuts
Imperial Brass Mfg. Co., Chicago
4000 gasoline pump assemblies
Crewe Name Plate & Eng. Co., Chicago
8250 name plates
Spicer Mfg. Co., So. Plainfield, N. J.
5000 Spicer universal joints

May 21, 1918

Mich. Plant Steel Prod. Co., Detroit
5000 reach rod assemblies
Indiana Lamp Co., Connersville
2500 sets lamps
Mich. Stamping Co., Detroit....3000 mufflers
Mich. Stamping Co., Detroit..4000 fan shrouds
Nat. Machine Prod. Co., Detroit
4000 spark and throttle control assemblies
National Can Co., Detroit....3000 radiators
Covert Gear Co., Lockport, N. Y.,
3000 transmissions
Covert Gear Co., Lockport, N. Y.
1000 clutches
Covert Gear Co., Lockport, N. Y
4000 controls
Prest-O-Lite Co., Indianapolis..3000 batteries
Mich. Screw Co., Lansing...8000 rear springs shackle pin and 8000 rear spring frt. bracket pins.
Briggs Mfg. Co., Detroit
2500 sets upholstery
Briggs Mfg. Co., Detroit
2500 tops and storm curtains

May 22, 1918

Edmunds & Jones Co., Detroit.2500 sets lamps
Burton Lowery Co., Detroit,
3000 sets upholstery
Thompson Mfg. Co., Des Moines,
3000 starting cranks
Muncie Gear Works, Muncie,
1500 transmissions
Hughes & Curren Co., Rochester,
3000 tops and storm curtains
American Auto Trimming Co., Detroit,
2500 tops and storm curtains
American Auto Trimming Co., Detroit,
2500 sets upholstery

May 23, 1918

Warner Gear Co., Muncie.....4000 controls
Warner Gear Co., Muncie.....3000 clutches
Savage Arms Corp., Sharon, Pa.,
3000 drawbar assemblies
Warner Gear Co., Muncie..2500 transmissions
Standard Parts Co., Cleveland,
3000 sets springs
Mather Spring Co., Toledo,
2000 sets springs
James McKay Co., Pittsburgh,
8000 towing chains
Stewart Warner Corp., Chicago,
8000 odometers
Mayer Carbureter Co., Buffalo,
4000 gasoline pump assemblies
E. D. Clapp Mfg. Co., Auburn, N. Y.,
16,500 sprag chain shackles
Packard Elec. Co., Warren, Ohio,
3000 wiring assemblies
Michigan Stamping Co., Detroit..4000 dashes
Michigan Stamping Co., Detroit,
5000 sets bumpers

May 24, 1918

Detroit Steel Prod. Co., Detroit,
1000 sets springs
Sheldon Axle & Spring Co., Wilkes-Barre, Pa.....2000 sets springs
Gemco Mfg. Co., Milwaukee....2000 mufflers
Hayes Mfg. Co., Detroit,
8000 electric light bulb cases
Columbia Axle Co., Cleveland,
8200 rear spring shackle bars
Hayes Mfg. Co., Detroit,
4000 hoods and hood sills
National Mach. Prod. Co., Detroit,
5000 steering gears, frame brackets
American Brass & Iron Co., Detroit,
8000 flared tube elbows
Mich. Stamping Co., Detroit....1000 mufflers
Guide Motor Lamp Co., Cleveland,
1500 sets lamps
Indiana Lamp Co., Connersville,
500 sets lamps
Sterling Motor Truck Co., Milwaukee,
8000 front spring pressure block
8000 rear spring pressure block
4000 intermediate brake lever
16,000 brake equalizer lever
4000 intermediate brake lever
8000 hood hinge rod bearing
3000 starting crank bracket (malleable)
5000 connection radiator to pump
4000 clutch pedal
4000 brake pedal with bushing
8000 pedal pad
4000 pedal shaft clutch lever
4000 intermediate brake shaft
16,000 brake equalizer arm and yoke
Hayes Mfg. Co., Detroit,
8000 battery attachment assembly
16,000 gasoline feed tank strap assembly
16,000 gasoline reserve tank strap assembly
8000 exhaust pipe clamp brackets

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100 Commerce Trucks Shipped

DETROIT, June 4—The Commerce Motor Car Co. last month shipped more than 100 of the trucks ordered by the government. A larger shipment was expected but the lack of sufficient materials retarded production. The company expects to more than double its initial output in June.

Investigate Alcohol-Gasoline Blends

N. A. C. C. Gathering Data to Aid in Exploiting Possibilities of Such Mixtures

NEW YORK, June 5—With a view to gathering statistics and oher information which will be of value in exploiting the use of mixtures and blends of alcohol and gasoline for use in internal combustion engines of every type, the National Automobile Chamber of Commerce is instituting a series of investigations. It is at present gathering data on processes of manufacturing alcohol and on the cost of production. Investigations are also being made to ascertain whether the distilleries and breweries of the country are disposed to go into the production of alcohol on a large scale.

The chamber is also checking up a number of reports of tests which have been made on various types of internal combustion engines operating on blends containing different proportions of alcohol and gasoline. Some of these tests have been made in the laboratory of the Automobile Club of America and others have been conducted by the Department of Agriculture at Washington.

The N. A. C. C. states that alcohol can be blended with gasoline to produce a suitable fuel that will avoid the difficulties of starting a cold engine on alcohol alone and without any change in the carbureter or the compression of the engine. At the present time practically all automobiles in Norway and Sweden are operating on alcohol made from waste from sulphite liquor from paper pulp mills.

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Bethlehem to Assemble B Trucks

WASHINGTON, June 6—An award for the assembling of 525 model B new series trucks has been made to the Bethlehem Motors Co., Allentown, Pa.

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Standards Division Subjects

(*Continued from page* 1100)

engine magneto drive shaft size and thermostat connection.

The Electrical Equipment Division will consider a proposed revision of the starting motor flanges, and will review reports of sub-committee on starting motor flanges, starting motor sleeve mounting, ignition distributer mounting, generator bracket mounting and starting motor cable terminals.

Most of the time of the Ball and Roller Bearings Division will be taken up with a review of the present situation with relation to thrust bearings and with a discussion of any alterations in the present thrust bearings data sheets that may be necessary. Tolerances for radial ball bearings and taper roller bearings will also be considered.

SCREW STOCK

Grade	No.	Carbon	Manganese	Phos.	Sulphur
S. A. E.	.1114	0.08—0.20	0.30—0.80	0.12	0.06—0.12
Bessemer	....	0.08—0.16	0.60—0.80	0.09—0.13	0.075—0.15
Open-hearth	....	0.15—0.25	0.60—0.90	Not over 0.06	0.075—0.15

Industrial Review of the Week

A Summary of Major Developments in Other Fields

May Iron Production Near Highest Point in History

Pig iron production in May was at a rate exceeded but once in the history of the industry. The total was 3,446,412 gross tons, or 111,175 tons a day, while that of April was 3,288,211 tons, or 109,607 tons a day. In October, 1916, the record month, the daily rate was 113,189 tons.

While 10 furnaces blew out last month 15 blew in, making a total of 359 active on June 1 against 354 one month previous. But relinings are likely to exceed resumptions in the summer months.

With charcoal iron estimated, the output of pig iron in May was at an annual rate of over 40,900,000 tons, compared with 38,647,000 tons in 1917, and the high record of 39,434,000 tons in 1916.

Two days of high heat in the past week were a reminder that lowered production may be expected as summer advances, sheet and tin plate mills being particularly affected.

The statement of the director of steel supply to the American Iron and Steel Institute that 16,800,000 tons in definite orders are on the books caused no surprise. Details are still lacking as to the time within which this amount can be actually used. But week by week steel makers are exerting themselves to the utmost to meet war demands, and still there is a scarcity, particularly in plates, with plate mill output reaching greater proportions than ever.

The demands for skilled labor for munition plants, shipyards and other vital industries is rapidly increasing, but men are not in sight. Plans are on foot for systematically making heavy drafts through regional committees upon workers whose ordinary employment is gone or will be because material is withheld.

Some days may yet elapse before a balance can be struck between the definitely scheduled demands the Government will make upon the steel industry in the remainder of the year and the country's newly ascertained capacity in the various finished forms required. The committee is still hard at work both in Washington and New York.

Meanwhile, new plans for larger war consumption of steel are coming out, the past week bringing further developments as to increased shipyard and fabricating capacity, the former taking in both coasts.

Use of Fuel Oil on Private Pleasure Yachts Restricted

WASHINGTON, June 3—The use of fuel oil on private pleasure yachts is restricted by an order issued by the United States Fuel Administration. No order affecting the use of gasoline or kerosene in either pleasure launches or passenger cars has been issued or is contemplated by the fuel administration. The order restricting the use of fuel oil in private yachts classifies these as crafts not operated for profit, and which derive their motor power either wholly or in part through the use of coal or fuel oil. The restrictions provide that from June 1, 1918, to May 31, 1919, no coal or fuel oil shall be consumed, burned, used on or furnished to a private yacht for any purpose other than for gally fuel. The order allows all private yachts away from the home port on June 1 to use sufficient fuel to reach its home port.

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To Build Largest Aviation Camp

WASHINGTON, June 3—The largest aviation training and concentration camp in the world will be located at Camp Greene, N. C., with 20,000 student fliers in training there at one time. This is being finished at the present time.

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Airplane Probe Is Progressing

(*Continued from page* 1101)

suggestions and ideas and occasional sarcasm marked the discussions. One congressman, apparently imbued with the idea that the atmosphere of France might be wholly different from that of the United States, feared that the various tests given the Liberty engine in this country would not suffice. He claimed that though the engine was a success here, it might be a failure in the air across the water. All criticisms of the Liberty engine were silenced by Congressman Kahn's declaration that the Allies had tested and ordered the engine in large quantities.

Other facts developed in the debates included the following:

There are 12,017 officers, 136,761 enlisted men, 4054 fliers in the aviation section of the Signal Corps, with 1316 airplanes in France and 3760 in this country.

Single-seater pursuit planes are being made in France, while the combat and bombing planes are being made in this country and equipped with Liberty engines.

One hundred and seven de Haviland bombing planes have been made and completed in this country.

The causes for delay in production are due to changes suggested frequently by our forces and the Allies abroad.

Of the $650,000,000 appropriated for airplanes, $316,517,000 has been spent for the airplanes in France and this country, the twenty-seven training fields and for engine parts, etc., while the balance is obligated for airplanes, special clothing, transports, etc.

The average price of a plane is $5,000 and of the engine $1,950 to $5,000.

The number of schools for airplane work in this country are as follows:

Bombing schools	191
Pursuit schools	145
Observers schools	88
Total	424

The flying officers are:

In this country	4606
Abroad	1590
Total	6196

The non-flying officers are:

In this country	6506
Abroad	1854
Total	8360

The number of cadets is:

In this country	2983
Abroad	2044
Total	5027

Shipments of planes and engines during the week ended April 27 were:

Primary training planes	110
Advanced training planes	19
Combat planes	7
Total	136
Primary training engines	241
Advanced training engines	108
Liberty engines	86
Total	435

Up to May 23, money expended for planes, propellers, etc., included:

Planes, propellers, parts	$186,154,369.79
Average per plane, $5000	
Engines and parts	240,803,176.65
Average per plane, $1950-$5000	
Balloons	9,590,204.54
Guns, ammunition and bombs	28,496,912.33
General equipment, including instruments	32,768,733.47
Clothing	2,519,824.79
Total	$500,332,221.57

The Hispano-Suiza, Bugatti and some other foreign engines will be made here for use in pursuit machines.

The Duesenberg company in New Jersey started to equip for manufacture of Liberty engines. They were ordered to change, after equipment was completed, for manufacture of Bugatti engines. Soon after getting ready for this work, another order by cable from abroad countermanded the manufacture of Bugatti engines and advised manufacture of Libery engines. Still later another cablegram directed the manufactue of the Bugatti. These various orders each created expense and delay.

England is producing 3000 airplanes monthly and France 2000 in each 30 days, a total of 5000 per month.

The original estimate of three airplanes needed for each flier has been changed to six airplanes per flier, making a quota of 108 machines needed for each squadron of eighteen fliers, or 24,000 airplanes for 4000 fliers.

Increased Demand For Labor

53 City Centers Have Calls Exceeding Present Supply—Only 3 Report Surplus

WASHINGTON, June 3—Increased demands for unskilled labor are shown by a report of the Department of Labor. Fifty-three centers have calls exceeding the present supply and only 3 cities report a surplus. Normal conditions are reported by 25 cities. Mechanics are also reported as being scarce. Only one city, in the South, reported a slight surplus. Thirty-two cities are calling for machinists, toolmakers and other mechanics, while an even balance between local supply and demand is reported by 42 cities.

Twenty-two cities need more skilled workers, with coppersmiths, blacksmiths, boiler makers and drop forgers in greatest demand. Normal conditions are reported in 42 cities and only one western center shows a surplus.

Serious unemployment continues in the building trades. Two cities show a demand for carpenters, but 34 other cities display a large surplus and 33 centers report normal conditions. The farm labor situation shows 31 cities demanding more labor for agricultural work in their sections, while 39 report normal conditions and 4 centers report a surplus. Twenty-four cities are having a shortage of domestic help and 39 normal conditions.

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National Oliver Week Designated

SOUTH BEND, IND., June 1—The Oliver Chilled Plow Works has designated the week of June 10-15 as National Oliver Week. During this time the entire sales organization of the 2 factories, 16 branch houses and 53 transfer houses, an aggregate of 500 men, will devote their energy to talking power farming, early fall plowing and buying of implements at an early date. The plan is in line with the efforts of the Department of Agriculture to impress upon the farmer the necessity of adequate agricultural implements.

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Oil Leasing Bill Passed

WASHINGTON, May 31—The House of Representatives has passed the oil leasing bill designed to open up more than 6,000,000 acres of government oil lands in the west to meet war requirements of the army and navy. The bill allows the government to lease to one man 560 acres of government oil land, or to a corporation not more than 5600 acres. The government will receive as royalty one-eighth of the oil obtained.

The bill further settles the difficulties between western oil men and the government over the closing up of reserve lands by the navy and Department of Interior, by allowing operators on government land whose wells were closed by government action 9 years ago to continue their work under the royalty leasing plan of the bill. Under the old plan the operators took the oil free from the government land.

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Detroit Oversubscribes Patriotic Fund

DETROIT, May 31—This city has exceeded its $7,000,000 Patriotic Fund by more than 40 per cent. Detroit and Wayne County have contributed $10,038,912, and it is believed that there are still many contributions which have not yet been listed. Employees of the Ford Motor Co. up to Monday night pledged $561,832. Henry Ford's personal contribution was $250,000.

A partial list of the contributions received follows:

Dodge Brothers (employees)	$265,000
Fisher Body Co.	115,000
Timken-Detroit Axle Co. (2 plants)	102,311
Cadillac (employees)	87,700
Cadillac (company)	50,000
Studebaker (Plants 3 and 4)	60,000
John F. Dodge	50,000
Horace Dodge	50,000

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Highway Committee Chairmen to Meet

WASHINGTON, June 3—Chairmen of highway committees of the State Councils of Defense will meet here for a conference Tuesday, June 4, with the Highway Transport Committee of the Council of National Defense. Ways and means for the coming year will be discussed.

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To Speed Up Deliveries

DETROIT, June 3—To conserve man power and transportation wholesale merchants are endeavoring to speed up truck deliveries. Circulars were sent to retailers and others urging them to accept sidewalk deliveries, to order in larger lots and to receipt for delivery immediately, in order to release the driver and the truck for other work more quickly.

Restrict Substitutes For Rubber

Imports of Gutta Percha, Gutta Joolatong, Gutta Siak and Balata Limited

WASHINGTON, June 3—The importation of rubber substitutes has been restricted by the War Trade Board as a further means of saving ship tonnage for direct war purposes. The announcement follows:

The restriction upon the importation of crude rubber, recently promulgated by the War Trade Board, has brought in its train restrictions upon the importation of four commodities—gutta joolatong, gutta siak, gutta percha and balata, possessing some of the characteristics of rubber, and capable under circumstances of being used as substitutes for natural rubber. It was feared that, with importations of crude rubber restricted, attention might be directed to these other substances, and that, unless checked, an importation of these would set in, which would take up all, or more than all, of the cargo space by the rubber restriction order, and more than defeat the purposes of this restriction, viz.: To render tonnage available for war purposes.

Some of these commodities contain a very high percentage of water, running as high as 65 to 70 per cent in the case of gutta joolatong, and these are very heavy and bulky, so that an extensive import would be highly injudicious.

Imports of gutta percha and balata will be restricted for the coming year from June 1, 1918, until March 31, 1919, to the quantities imported last year—650 tons of gutta percha and 1,400 tons of balata.

Imports of gutta joolatong and gutta siak from overseas will be restricted entirely in the future. Those shipments on which export bills of lading from the foreign port of origin are issued before June 1, 1918, will be permitted entry when they arrive.

The War Trade Board has extended to importations of gutta percha and balata, and to those imports of gutta joolatong and gutta siak now en route, the principle of option control of price which has already been successfully applied in the case of crude rubber. Importers will be required to deliver to the American Government an option, giving to the United States Government the right to purchase at the standard prices fixed by the War Trade Board the imports at any time until they have been sold and actually delivered to the manufacturer.

The intent of this provision is to prevent a speculative increase in the prices of these commodities on account of the restricted quantities available for consumption in this country, and to limit quotations to the normal figures prevailing before the introduction of the restriction.

Calendar

RACING

June 22 — Chicago. Chicago Speedway.
July 4—Cincinnati. Cincinnati Speedway.

ASSOCIATIONS

June 3-4 — Chicago. National Gas Engine Assn. Eleventh Annual. Hotel Sherman.
June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.
June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

SHOWS

Sept. 23-28—Chicago, National Accessory Show for Fords. Coliseum.
Oct. 14-27—Dallas, Tex. Seventh Annual Texas Automobile Show. Texas State Fair.

ENGINEERING

June 26-28 — Buffalo, N. Y. American Society of Heating and Ventilating Engineers.
Sept. 2 — Cripple Creek, Colo. American Institute of Mining Engineers.
Nov. 14-15—New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.